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CLASSIFICATION OF THE BANANAS

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III. Critical Notes on Species*

c. **M. paradisiaca** *L. Sp. Pl.* 1043 (1753) and

M. sapientum *L. Syst.* ed. 10, 1303 (1759)

It is not within the main purpose of these notes to discuss varieties of edible bananas or Latin names that have been applied to them, but exceptions must be made of the two Linnean combinations that dominate the whole literature of the genus. These two names are still valid, and between them cover a large number of horticultural varieties, but they are frequently misapplied. Their correct application requires some knowledge of their history, and as they have been from the beginning closely connected they may best be discussed together.

The commonest usage is that *M. paradisiaca* is applied to " plantains " and *M. sapientum* to " bananas ", but many authorities have pointed out that a specific distinction between plantains and bananas is artificial. Several botanists, after noting the close resemblances between plantains and *some* dessert bananas, have gone on to assume close relationship between plantains and *all* bananas, and have treated all, or nearly all, the varieties as belonging to a single species. Those having any respect for priority in nomenclature have called the omnibus species *M. paradisiaca*, but by proceeding to recognize a var. *sapientum* they have destroyed any convenience that their sweeping taxonomic conclusion might have created and left the division between typical *paradisiaca* and its " variety " as unsatisfactory as ever. Most of the nineteenth century botanists, lacking our modern regard for priority, have chosen to regard *paradisiaca* as a variety of *sapientum* and so added to the general confusion. Still others, despairing in face of the diversity of forms to be classified, have gone to the other extreme and created new " species " *ad libitum* until we are confronted today by some 50 Latin binominals all referring to edible bananas.

* Continued from K.B. 1948, p. 28.

One approach to the problem of nomenclature of the cultivated edible bananas is by ignoring all the associations that have grown up round the Linnean names, and trying to view the whole assemblage as though its complicated literature did not exist. From this approach we have found that all the varieties we have been able to study at I.C.T.A. fall into three groups rather than two. To be more comprehensive, the edible forms of *Musa* appear to fall into four groups altogether : but one of those groups comprises the " fehis " of the Pacific islands, which I do not regard as " true " bananas and shall not mention again in this connexion. The Indo-Malayan bananas (including plantains) fall into three groups and can be associated with two natural species already discussed in these notes—*M. acuminata* Colla and *M. balbisiana* Colla.

The first group, and apparently the largest, contains those showing predominantly the botanical characters of *M. acuminata* and judged to be probably derived from that species. The second group comprises those showing predominantly the characters of *M. balbisiana*, and deemed to be derived from that species. The third group consists of a relatively small number of varieties that show a blend of the characters of *M. acuminata* and *M. balbisiana* and cannot be referred directly to either. Observations of phenotype suggest that the members of this third group have originated from hybrids between the two species named, and that hypothesis of their origin has lately been largely confirmed by experiment. K. S. Dodds and N. W. Simmonds (*Journal of Genetics*, **48** (1948), 285-93) have described the synthesis at I.C.T.A., from a cross between the two species, of an edible banana closely resembling an established horticultural variety in the group.

Returning to the Linnean types with this classification in mind, I interpret *M. paradisiaca* L. as a member of the first group, and *M. sapientum* L. as a member of the third. From that opinion two others naturally follow : firstly that *M. paradisiaca* and *M. sapientum* are not in any strict sense conspecific, so that the combination *M. paradisiaca* var. *sapientum* is taxonomically unsound ; secondly that *M. sapientum*, being a hybrid, can have no " wild form."

The identity of the original *M. paradisiaca* L. is clear enough, and has never been seriously disputed. When he wrote the first edition of *Species Plantarum* Linnaeus was familiar with only one type of banana, but he had had opportunities of seeing that one in a living condition. He called it *Musa paradisiaca* with this diagnosis :

1. Musa spadice nutante . . . . . paradisiaca
   Musa racemo simplicissimo. Hort. cliff. 467. Hort. ups. 301. Fl. zeyl. 368. Roy. lugdb. 10.
   Musa cliffortiana Linn. mus. 1. t. 1. Musa. Cluss. exot. 229. Sterb. citr. t. 4.
   Ficus indica, fructu racemoso, folii oblongo. Bauh. pin. 508.
   Palma humilis, longis latisque foliis. Bauh. pin. 107.
   Habitat in India.

Identification depends, of course, on the references, and especially that to " Musa cliffortiana", which was a plant growing under glass in the garden of George Cliffort near Haarlem. Linnaeus saw this plant in

flower in 1736, and besides describing and figuring it, took the opportunity to review the " names, systematics, generic characters, specific characters, attributes, uses and literature of *Musa* " in a tract : *Musa Cliffortiana, florens Hartecampi* 1736 *prope Harlemum*, which has much historical interest as a compendium of the " pre-Linnean " literature. The " Musa racemo simplicissimo " of *Hortus Cliffortianus* (1737) was the same plant, on which he added some further notes. It must be admitted that " Musa Cliffortiana," growing under unnatural conditions, produced a very poor bunch of fruit ; and if the drawings of it had to be taken alone precise identification would not be possible. The figures are not, however, inconsistent with the characters of a common " plantain", and that identification is confirmed by later publications.

By 1759 Linnaeus was aware of the existence of another banana variety, and in the 10th edition of *Systema Naturae* he distinguished the two known to him as :

paradisiaca M. floribus masculis persistentibus Ehret. select. t. 18, 19, 20, Hasselqu. it. 493

sapientum M. floribus masculis deciduis Ehr. sel. t. 21, 22, 23.

For *paradisiaca* the mention of persistent male flowers (an uncommon character among edible bananas) is enough to confirm the identification of the type already defined by " Musa Cliffortiana." The cited illustrations, which are coloured drawings by G. D. Ehret in Trew's *Plantae Selectae* of 1750, put the identity beyond all doubt. The drawings (18–23) depict in fact a pair of *Musa* varieties mentioned or described by several writers of the seventeenth and eighteenth centuries, and distinguished as " the plantain tree " and " the banana tree". We shall have to discuss the pair further, but for the moment are only concerned with the fact that " t. 18, 19, 20 " are easily recognizable as a common type still called " plantain". It is on this basis that the Latin name *paradisiaca* has become closely associated with the English name " plantain."

The persistence or non-persistence of faded male flowers on the rachis is not by itself a sufficient character on which to separate species. We have no reason to suppose that Linnaeus himself regarded it as any more than a useful key character for distinguishing two quite different plants in the minimum number of words. Whatever he intended, it happened that there were sufficient points of difference between his *M. paradisiaca* and his *M. sapientum* to justify the specific distinction. But, as many later botanists have noticed, there are a great many varieties of bananas with deciduous male flowers that resemble *M. paradisiaca* very closely in more fundamental characters and should be regarded as conspecific with it. They happen to differ in having fruits that are less starchy and more sweet, a character that affects the manner of their use, and obsessed by the idea of keeping up a botanical distinction between " plantains " and " bananas " these botanists have referred the dessert kinds to a var. *sapientum* without critically examining the type belonging to that name.

As implied above, we find that a grouping of banana varieties according to their resemblances in botanical characters to *M. paradisiaca* (ignoring as unessential the question whether the fruit is palatable when raw or needs cooking) corresponds to a grouping on resemblances to the fertile

diploid species *M. acuminata* Colla. The name *M. paradisiaca* may therefore properly be extended to cover this whole group of horticultural varieties, and *M. acuminata* may be regarded as its most probable "wild form." The extension of *M. paradisiaca* to cover wild forms, with reduction of *M. acuminata* to synonymy or varietal status, might be thought logical ; but it is not, in my opinion, desirable at the present time. Both the cultigen and the wild species are extremely variable, and the connexion between them is still largely hypothetical. That there is some connexion is beyond reasonable doubt, but the possibility of contributions from other wild species to the gene-complex of *M. paradisiaca* cannot yet be denied. In attempts to simplify nomenclature we have to remember that the cultigen is not an interbreeding population, but simply a collection of sterile clones, and though we have necessarily to speculate about the relationships of the clones we should avoid a nomenclature that would imply that all the problems of origin of the edible bananas are solved. On these grounds I can see nothing lost in accuracy and much gained in convenience by keeping the cultigen and the wild species under different names, at least until we know much more about the genetics of both of them.

Similar objections do not apply to the identification of banana varieties of my second group with the fertile species *M. balbisiana* Colla. *M. balbisiana* is, in its wild forms, a much less variable and more clearly defined species than *M. acuminata*, and that fact alone makes the connexion between the fertile and the edible forms more obvious. Any hybridization with another species would almost certainly be detectable in the phenotype, as it is in the third group, and where there is no outward sign of any mixture I think we are quite safe in referring edible forms to the same species as the wild ones.

As for *M. sapientum*, the three words "floribus masculis deciduis" are all the "original description" we have to go on, and they take us nowhere. The type must, therefore, be fixed by Ehret's three figures, 21, 22 and 23, and nothing else.

Tab. 21 is "Musa caudice maculato fructu recto rotundo breviore odorato. Sloan. Cat. Jam. p. 192. Itinerar. T. 11. p. 147".

Tab. 22 is "Musae fructu breviore spadix floriger in magnitudine naturali" and shows female flowers with a pinkish perianth. It is the most useful of the three drawings for the identification of the type.

Tab. 23 is "Musae fructu breviori spadicis fructiferi verticilli tres priores in magnitudine naturali, cum fructibus nonullis ex maturitate dehiscentibus." It shows ripe fruit, very short and broad, blunt at apex, and several of them split. This drawing is more of an obstacle than a help, because the fruit shown is much broader in proportion to its length than any banana I have ever seen, and my attempt to identify the type has to assume that in this respect Ehret's drawing was bad.

In other respects, though evidently not photographic in their accuracy, Ehret's figures are very good for their time, and they convey one fact about which I am quite positive—that the plant depicted had *balbisiana* genes and must on that account be accepted as specifically distinct from *M. paradisiaca*. The flowers in tab. 22 are in fact sufficiently lifelike to

suggest to me at once a certain variety of banana in the I.C.T.A. collection. Taking the reference to Sloane as an indication that the variety was a West Indian one, and putting together all available evidence about the varieties that have been longest in the New World, I found that it pointed to the same variety. This is I.C.T.A. Type 17, known in Trinidad as Silk Fig, in several other New World countries as the Apple banana, and in the East as Rastali.

This banana is one of the commonest varieties in cultivation in the West and not uncommon in the East, and is esteemed in many countries as one of the best of the dessert kinds. It doubtless owes its quality largely to *acuminata* genes in its make-up, because bananas referred directly to *balbisiana* are not as a rule very good for eating raw ; at the same time its distinctive flavour, often commented upon as " applelike," no doubt depends on the modification by the *balbisiana* genes of the flavour more general in *paradisiaca* varieties. I can find no variety which is either a better match for Ehret's pictures or more likely to have been " the banana tree " of the seventeenth century West Indies, and therefore advance Type 17 as the most probable representative of the Linnean type. The name *M. sapientum* may be extended to cover other varieties of similar putative origin, but should, I think, be restricted to those, and will by that usage have only a narrow application among the dessert bananas.

Bananas and plantains

The association between the Latin and English names (*paradisiaca* with plantain and *sapientum* with banana) is so long-established and familiar that it is difficult to break down. I believe that it must be broken down before we can arrive at any approximately correct nomenclature for the cultivated bananas, and, as old and familiar usage should not be set aside without reasoned justification, the position may be made clearer by showing that the association arose quite accidentally in the first place and never had good authority behind it.

We have first to recognize that there is not complete consistency in the use of the English terms. In the East, the word " plantain " is often used for any banana and the sweeter kinds may be distinguished as " table plantains " or " dessert plantains." This usage is in line with that of the natives of countries where bananas are indigenous. The Malay " pisang " for example is used for cooking and dessert bananas alike, and in the Eastern sense " plantain " may be regarded simply as a translation of " pisang."

The usage that has become general in modern literature started in the West and is the one we have to discuss. By this, the term " plantain " is used for a small and fairly well-marked class of cooking bananas, including two or three varieties that have the largest fruits in the whole genus. It does *not* cover all cooking bananas by any means ; and the statement that "plantains" are cooking bananas and " bananas " are dessert varieties is an over-simplification of the position. Plantains are cooking bananas, certainly ; but not all cooking bananas are plantains, and in fact many of the varieties referred to *M. balbisiana* are generally cooked before consumption, but not regarded as plantains.

The word " plantain " therefore has, in the commonest usage, a certain botanical significance which should be recognized. All plantains (at any rate in the West Indies) belong to *M. paradisiaca*, and they form a recognizable group of varieties within that species. If a Latin name is required for the group (though I cannot see any necessity for it) it may perhaps be found in *M. paradisiaca* L. var. *normalis* Otto Kuntze (*Revisio Generum Plantarum*, 691. 1891) ; but there is no corresponding name that I know for the sweet varieties of *M. paradisiaca*, since var. *sapientum* is not available.

The term " banana " in the common usage means in effect " any edible *Musa* fruit that is not a plantain", and we have seen that that " definition " covers a heterogeneous assemblage. I have read many discussions of the " plantain and banana " question, but found no emphasis on two points that appear to me important. They are, that the distinction between plantains and bananas arose in countries where *Musa* is not indigenous, and that it became established at a time when very few varieties of bananas had come under accurate observation.

As to derivations, " plantain " is from the Spanish " platano " and " banana " is said to be a Guinea word introduced elsewhere with the fruit by the Portuguese. Both of them applied originally to the whole range of *Musa* fruits, and it appears to have been in English that they came into apposition. I have not been able to trace the earliest use of them in the modern way, but it seems to have been general in the West Indies in the seventeenth century. *Kew Bulletin* of 1894 (p. 253) mentions Ligon's *History of Barbados*, published in 1657, as containing one of the earliest accounts of the banana and plantain and distinguishing the two. Sir Hans Sloane's *Catalogue of Jamaican Plants* (1696) has the distinction, and it is clearly set out in Philip Miller's *Gardeners' Dictionary* of 1731 and other works of the time. Probably it antedates Ligon by some years, but the significant fact is that even the later works all refer to " the plantain tree " and " the banana tree " and not to plantains or bananas in the plural. It is hardly to be supposed that there were only two varieties of *Musa* in the West Indies at the end of the seventeenth century ; but the records are very scanty, and although the first introduction (to Santo Domingo) is generally accepted as being in 1516 we do not know how many varieties were then introduced or how they spread. The descriptions in the works cited strongly suggest that in the British islands, at least, only two were at all commonly planted. Perhaps one was obtained from a Spanish and the other from a Portuguese source. In any event it seems to have been quite by chance that, out of all the many banana varieties that exist, the two at first generally established in the West Indies belonged to different genetic groups so that the culinary difference in the quality of the fruit was reinforced by genuine botanical (specific) differences.

We have seen that illustrations of the same two were before Linnaeus when he distinguished *M. sapientum* from the *M. paradisiaca* that he had known earlier. How much he was influenced by the different names we shall never know, but certainly he did not quote the vernacular names himself, and we may therefore hold that Linnaeus was *not* distinguishing between " plantains " and " bananas " but simply between one *Musa* (which happened to be called " the plantain tree " in Jamaica) and

another (which happened to be called " the banana tree"). The first to attach vernacular names to the Linnean epithets seems to have been Willdenow, who in the 4th edition of *Species Plantarum* (1806) added under *M. paradisiaca* " Gemeiner Pisang " and under *M. sapientum* " Bananen pisang "—the latter a curious invention indeed.

Post-Linnean History

A history of the nomenclature of cultivated bananas after Linnaeus would go beyond the scope of these notes, but mention may be made of two nineteenth century botanists whose opinions have been frequently quoted.

W. Roxburgh, working in India, was struck by the similarities between many cultivated bananas and a wild species which he thought must be " the wild sort " of *M. sapientum*. This species, which he mentioned in *Hortus Bengalensis* (1814) and described in some detail in *Flora Indica* (1824) was the one we now call *M. balbisiana* Colla. His conclusion was a fairly natural one, because the banana varieties of India belong predominantly to our second and third groups ; but Roxburgh failed to notice the bispecific origin of the whole assemblage and therefore regarded *M. paradisiaca*, of which he knew only three or four varieties, as " a variety of sapientum only."

S. Kurz, observing the genus further East and in greater variety, did hit upon the bispecific origin and discussed it in a remarkably valuable " Note on the Plantains of the Indian Archipelago " (*Journ. Agric. Hort. Soc. India* XIV. 295–301. 1865–66). He began in 1878 to publish a much longer work entitled " The Banana : a pomological contribution " (*ibid.* n.s. V. 112–168. 1878) but little more than his introduction appeared, and the rest of the article was lost by his death. The part that appeared shows Kurz as a careless writer, but a very acute field observer, and as he had probably spent more time observing *Musa* in regions round or near its centre of origin than any botanist before or since, the loss of his completer notes was a serious one.

Kurz was the first to state a belief that the majority of banana varieties in the Malay Archipelago are descended from the species that he at first called *Musa simarium* Rumphius, and later corrected to *M. acuminata* Colla. He did not connect this species with *M. paradisiaca*, probably because he was influenced by Roxburgh's writings, for like Roxburgh he regarded *M. paradisiaca* as " included in " *M. sapientum* and applied the latter name to *M. balbisiana*.

Kurz's failure to connect up when so near the truth is responsible for a curious situation affecting a variety of plantain that has been called *Musa corniculata*. This was first described by Rumphius as " Pissang Tando seu M. corniculata " and the name was taken up by Loureiro in his *Flora Cochinchinensis* (1790) with this description :

> Sp. 4. Musa corniculata. a. Chuoi Boi. Differ. spec. Mus. *racemo* reclinato ; *spatha* universali, 2-phylla : *fructu* maximo. Hab., et notae. *Caulis* mediocris. *Spatha* universalis : partiales nullae. *Racemus* reflexus, brevis : racemulis sub-ternis, paucifloris. *Fructus* 1-pedalis, curves, sub-teres, crassus, aspermus, in aliquibus luteus, in aliis rufus, nitidus. Pissang Tando, seu Musa corniculata. Rumph. Amb. 1. 8. cap. 2. pag. 130.

Making allowance for Loureiro's style, it seems to me impossible to avoid the conclusion that he was referring to the Horn Plantain, a common cooking banana known today in Malaysia by numerous variants of the name Tandok. The peculiarity of this is that the male bud aborts almost immediately after the change of sex in the inflorescence (hence " spathae partiales nullae ") and this feature makes the Horn Plantain a very conspicuous variety—or perhaps group of sub-varieties.

In spite of its distinct appearance, it is in most characters very similar to other plantains, both vegetatively and in the fruit, and a bunch of typical *M. paradisiaca* with the rachis and male flowers cut off below the fruit looks very like a bunch of *M. corniculata*. One would have supposed that this would have been referred by almost all later authorities to *M. paradisiaca*, but it has usually been maintained as a separate species.

Kurz thought that " Loureiro's *M. corniculata* cannot be the same as Rumph's ", but gave no reasons, unless one is implied in the statement that the species " ranges from the Moluccos to Java". Pisang Tandok seems from more modern accounts to have a much wider range, and I know no reason why Loureiro's plant should not be identified with it. However that may be, Kurz himself (using the name *sensu* Rumphius) re-described the plant first as *M. simiarum* var. *corniculata*, and later as a distinct species with the note that " this is hardly more than a monstrous variety of *Musa acuminata*". I have given these facts at some length because the form provides such an excellent link between Kurz's conception of *M. acuminata* as a species comprising both wild and cultivated forms and our conception of an *acuminata-paradisiaca* assemblage covering the same range.

Characters of the groups

It is one thing to recognize three groups of edible bananas when a large collection of varieties is available for observation, and quite another to draw up descriptions clearly defining the groups and rendering them easily recognizable to others. I do not feel able to do the second thing, and incline to doubt whether it can be done until we have large numbers of detailed varietal descriptions to illustrate the limits of the groups. The differences are mainly those small ones that go to make up *facies*, and when each is examined singly it is found unreliable for universal diagnosis.

Nevertheless I attempt a few generalizations about the *paradisiaca* and *balbisiana* groups, which may be compared with the descriptions given of *M. acuminata* and wild *M. balbisiana*. Of the *sapientum* group nothing more precise can be stated than that it shows a blend of characters from both the others.

1. Bananas of the *paradisiaca* group include both diploid and triploid clones, and in general the diploids are more slender than the triploids, and may be as slender as wild *M. acuminata*. In *M. balbisiana* even the wild diploids are robust in proportions. Consequently any banana variety with a pseudostem slenderer than the average is likely to belong to the *paradisiaca* group.

2. Any variety showing chocolate-brown blotches on the leaves, even if only on young leaves of suckers, is almost certainly referable to *M.*

FIG. 1. *M. paradisiaca* L. Complete fruit bunch, showing male bud and persistent bracts.

FIG. 2. I.C.T.A. Type 17, Silk Fig (*M. sapientum* L. ?). Male bud.

FIG. 3. Type 17, fruit bunch.

Scale in inches in each case.

Photographs by K. S. Dodds.

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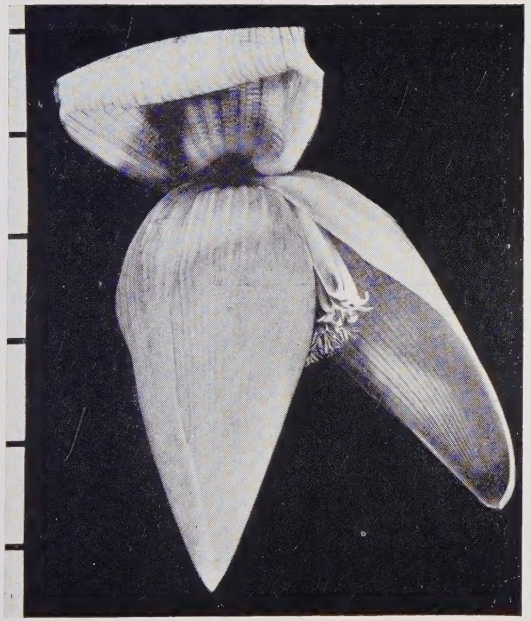

Fig. 1.

Fig. 2.

M. banksii F.v.M. Fig. 1. Male bud.
Fig. 2. Fruit bunch.

Scale in inches.

Photographs by K. S. Dodds.

paradisiaca, as this character is not recorded and has not been observed in *M. balbisiana*.

3. In *M. paradisiaca* the margins of the petiole are usually erect or spreading, and at the base where the petiole passes into the leaf sheath the margins usually become scarious as soon as the leaf is mature ; if they remain alive, they may be slightly bent out away from the pseudostem ; they are often red-bordered. In *M. balbisiana* the margins of the petiole are usually incurved, almost closing over the adaxial groove, at the base they clasp the pseudostem very closely and do not become scarious ; they may be green or black-bordered.

4. The peduncle is most commonly pubescent in *paradisiaca*, glabrous in *balbisiana* varieties.

5. The male bud in advanced blooming tends to be top-shaped and acute in *paradisiaca*, more ovate or lanceolate in *balbisiana*. The bracts are often, though not always, convolute in *paradisiaca*, nearly always imbricate in *balbisiana* ; they are also in general broader and more obtuse in the latter. The number of bracts lifted at one time is a good character : they lift one at a time in *paradisiaca* (the common dwarf banana, called Canary or Cavendish, is a notable exception) and two or more at a time in *balbisiana*. In bract colour, reddish purple usually indicates *paradisiaca*, though bluish-purple is not uncommon in that group as well as being general in *balbisiana*. The *inside* colour of the bract is more useful than the outside : in *paradisiaca* varieties the bracts are nearly always paler at the base within, in *balbisiana* they are a uniform dark crimson to the base.

6. In the male (or female) flowers, a suffused pink colour in the free tepal usually indicates *balbisiana* genes. The male flowers also flare more widely open in this species than in *paradisiaca* varieties.

7. The fruits of *balbisiana* varieties are generally broader in proportion to their length than those of *paradisiaca* varieties. Actual lengths of course vary widely in both groups, but the longer and slenderer varieties are mostly *paradisiaca*. There seems to be also some difference in geotropic response. In all bananas the young fruits reflex as they develop and are negatively geotropic, but whereas in *paradisiaca* varieties the mature fruit is nearly always curved, in *balbisiana* varieties observed by me the response is confined to the pedicel, and the body of the mature fruit is therefore straight.

8. If seeds occur, or are induced by suitable pollination, they afford the best diagnostic character of all, being sub-globose in *balbisiana* and strongly flattened in *paradisiaca*.

CLASSIFICATION OF THE BANANAS

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III. Critical Notes on Species.

d. **Musa banksii** *F. Muell., Fragm.* 4 : 132 (1863–64)

Mueller's original description is as follows :—

Musa Banksii. Modice elata, mox stolonifera, trunco subcylindraceo, foliis undique laete virentibus ellipticis petiolo exalato circiter triplo longioribus basi obtusiusculis et parum inaequilateris, bracteis 12–16-floris, calycum divisione exteriore interiorem cuneato-obovatam subito brevi- et angusto-acuminatam fere triplo excedente, staminum fertilium filamentis anthera fere triplo brevioribus, *fructibus pedicello tenui tantum bis terve longioribus gracile cylindraceis vix angulatis haud pulposis, seminibus parvis numerosissimis* loculos biseriatim explentibus laevibus brunneis.

In vallibus silvarum ad montem Elliot, *Fitzalan.*

Planta adspectu *Musae paradisiacae*, omni parte glabra, mox novos caules e radice pullulans. Folia 5–6′ longa, 1½–2′ lata, acumine per-brevi angusto et marcescente terminata, nervis et nervulis patentisseme et tenuiter striolata. Petioli profunde canaliculati. Bracteae florum masculorum ovato-lanceolatae, circiter 4″ longae. Flores intra quamcunque bracteam duplice serie siti. Pars exterior calycis (i.e. sepala 3 exteriora et 2 interiora in unum connecta . . . .) 15‴ longa et 4‴ lata, pulchre striata, apice 5-dentata ; dentes 3 exteriores deltoideo-semilanceolati, vix 1½‴ longiores ; his 2 interiores sat conformes, sed breviores. Sepalum interius impar cuneato-obovatum, integerrimum, tenere membraneum, fere 5‴ longum, cetera parte calycis circumclusum, e truncato vel rotundato apice subito acumen lineare acutissimum 1‴ longum producens. Stamina 5 fertilia. Filamenta 3–4‴ longa, sursum crassiora. Antherae circiter 8‴ longae, paene 1‴ latae, introrsae, lineares, acutiusculae, loculis longitudinaliter dehiscentibus. Stylus calycem subaequans, inferne tenuius filiformis, superne sensim in stigma clavatum incrassatus. Stigma 1‴ longum, in lobulos obtusos divisible. Flores foeminos non vidi. Fructus duplicibus seriebus haud conspicue distantibus distributi, pedicello 1–2″ longo gracili praediti, utplurimum inter 4 et 5″ longi et 2/3–1″ lati, maturitate omnino indurantes, septis crassiusculis haud evanescentibus triloculati. Semina in loculis bi-rarius triseriata, arctissime approximata, laminis potius cartilagineis quam membraneis demum paulisper carnulentis forsan arillaribus sejuncta, axi affixa, oblique horizontaliter disposita, magis minuve rotundata, mutua pressione angulata, leviter v. saepius conspicue depressa, circiter 2‴ metientia ; umbilicus pallidus, circularis, ½‴ metiens. Testa saturate brunnea, laevis cartilagineo-coriacea.

A point to be noted is that Mueller says he had not seen female flowers, and the description was evidently from a fruiting plant. Fruits, doubtless of the same collection, are in the Kew Herbarium labelled " Musa banksii. Mount Elliott. Mueller 1864. Fitzalan."

Bentham later (*Flora Australiensis* **6,** 261–262 : 1873) gave a description of the species based on three specimens : the Fitzalan plant from Mount Elliott ; *Dallachy*, Rockingham Bay ; and " a specimen cultivated in the Melbourne Botanic Garden". In this he included female flowers, which are specifically stated to have been described from the Melbourne specimen, and as Bentham had evidently not seen the plant himself (his habit notes are quoted from Mueller with inverted commas) it seems likely that he had dried rather than fresh material. His description is :

Female flowers with an ovary of nearly ¾ in. Outer perianth segment under 1 in. long, the outer lobes narrower and more acute than in the males, the inner lobes linear ; lower inner segment narrow-lanceolate, above ½ in. long. Anthers linear but smaller than in the males. Style rather shorter than the outer perianth-segment, thickly clavate towards the end, with a large concave oblique unequally lobed stigma.

The ovary length given is surprising, as an ovary only ¾ in. long in a functional female flower would be remarkable in the genus *Musa*, and especially in a species developing a fruit 5 in. long : as a rule the ovary is about half the length of the mature fruit.

In an envelope attached to the Kew Sheet of the Mount Elliott material and marked " Herb. Muell. 1873 " there are dried flowers corresponding to Bentham's descriptions, and it seems reasonable to suppose that they come from the Melbourne plant. Most of them are male, with very short ovary rudiments, but one or two have ovaries ¾ in. long. I doubt whether these are functional female flowers of any species, and think it much more likely that they come from a " transitional hand " such as often occurs between the female and male parts of the inflorescence. Apart from this, the male flowers also are smaller than those described by Mueller, and it is open to doubt whether the material in the envelope belongs to the same species as the fruits on the sheet.

Little else is recorded about *M. banksii*. F. Manson Bailey (*Queensland Flora* **5,** 1598 : 1902) gives a description evidently drawn from Bentham, though he cites an additional collection (" Morgogaba", Cleveland Bay, *Thozet*) and adds " not uncommon in the tropical scrubs". J. G. Baker (in Ann. Bot. **7,** 217 : 1893) gives a description also based on the earlier ones and adds a citation of *M. banksiana* Kurz. in *Journ. Agric. Hort. Soc. India*. N.S. **5,** 64. *M. banksiana* is only a name in the synoptic key included in Kurz's unfinished article of 1878 : it can safely be regarded as a synonym, for it would be just like Kurz to write " banksiana " for " banksii".

I refer certain plants in the I.C.T.A. collection to this species on the strength of their general agreement with Mueller's description and the close resemblance of their fruits and seeds to those of the type specimen. They have *hermaphrodite* lower flowers, much larger than the " females " described by Bentham ; but the facts given above are held to justify ignoring that discrepancy. A determination from a description and a fragmentary specimen must always be somewhat uncertain, and this one may possibly be found erroneous when all the *Musa* species of Queensland are better known. At present I can see no good reason for regarding our plant as specifically distinct from Mueller's.

The material referred to *M. banksii* in the I.C.T.A. collection came from three sources. The first received, I.R. 110, came from the Mandated Territory of New Guinea, locality unspecified : the second, I.R. 139, from Queensland, Bloomfield River area, which is about 250 miles from the type locality of *M. banksii* : the third, I.R. 162 from Queensland, locality unspecified, but sent as *M. banksii*. All three plants were certainly conspecific, and must therefore represent a fairly common and well distributed species. The species is not very vigorous under Trinidad conditions, and only the Bloomfield River plant survives. From it I draw up the following description to be uniform with those of other species in the collection :

Plant stooling rather sparsely ; pseudostems 3–4 metres high, about 25 cm. in diameter at base, green with copious brown blotches ; leaf sheaths and petioles lightly waxy. *Leaf blades* oblong, 1·5–2 m. long, about 60 cm. wide, truncate at apex, rounded at base, green on both sides, midribs pale yellowish green ; petioles 45–60 cm. long, fairly stout, their margins erect, appressed to the pseudostem at base and early becoming scarious at the junction. *Inflorescence* subhorizontal or more or less pendent, its peduncle and rachis shortly and softly pubescent ; basal flowers hermaphrodite, the number of fertile " hands " varying up to about 8, upper hands male. *Hermaphrodite flowers* about 10 per bract in two rows ; compound tepal white, about 3·5 cm. long, its lobes yellow, the lateral ones narrow, up to nearly 1 cm. long, with well developed dorsal filiform appendages ; free tepal 2–2·5 cm. long, strongly boat-shaped, with a prominent (5 mm.) apicula ; fertile stamens usually 2–4, with staminodes of various lengths making up an androecium of 5 members, fertile stamens exceeding the style and finally the perianth in length ; ovary pale green, glabrous, 8–10 cm. long, including a pedicel which at the flowering stage is scarcely distinguishable from the ovary itself. *Male bud* in advanced blooming turbinate, acute, the bracts convolute at the tip. *Bracts* pale yellowish green outside, longitudinally sulcate, slightly glaucous, the inner surface pale yellow or whitish ; only one bract lifted at a time, bracts strongly revolute on fading and early deciduous. *Male flowers* 10–15 per bract in two rows ; compound tepal 3–4 cm. long, white with pale yellow teeth, the lateral teeth up to 5 mm. long, their appendages nearly 2 mm. ; free tepal about half as long as the compound tepal, translucent, boat-shaped, transversely corrugated just below the 2–3 mm. apicula ; stamens at first as long as the perianth, later slightly exserted. *Fruit bunch* rather lax. *Individual fruit* 10–12 cm. long, about 2 cm. in diameter, subcylindrical, only obsoletely angled at maturity, narrowed rather gradually at base into a slender pedicel 1·5–2·5 cm. long, abruptly acuminate at apex, the acumen short (5 mm.) or occasionally obsolete, crowned by the remains of the perianth, which tends to persist in a withered condition ; pericarp 1–1·5 mm. thick, ripening yellow ; pulp scanty, cream in colour. *Seeds* black, irregularly angulate, smooth on the facets, 5 mm. across and 4 mm. high.

A fourth plant in the I.C.T.A. collection, I.R. 123, was raised from seeds from Western Samoa, kindly sent by H. C. Reed Esq. of Apia, and seems referable to *M. banksii* but as a distinct variety. When this plant flowered, it resembled nothing else in the collection, and nothing among published descriptions seemed to fit it. Observations gradually accu-

mulated to show that in physiology, breeding behaviour, and essential morphological characters it agreed with *M. banksii*. The features distinguishing it, though conspicuous, were nothing but larger size of plant and fruit, and purple bracts. These are characters which do not warrant specific separation, but do require the recognition of the Samoan plant as a named variety, which may be diagnosed as :

Musa banksii *F. Muell.* var. **samoensis** *Cheesman, var. nov.* A typus bracteis purpureis et fructu majore differt ; etiam altior et robustior est.

Both type and variety cross readily with forms of *M. acuminata* Colla and give fertile hybrids. On this ground, as well as on consideration of the many close resemblances between the species in habit and floral characters, I am very doubtful whether *M. banksii* ought to be maintained as a species at all. For the present it may be maintained for convenience, but intermediate forms may be discovered in New Guinea or the Moluccas connecting it so closely with the polymorphic *M. acuminata* assemblage that it has to be reduced to varietal status. On present evidence we regard it rather as " replacing " typical *M. acuminata* at the south-eastern extremity of the range of that species, but its genotypic differentiation is evidently slight.

I am indebted to Mr. V. S. Summerhayes for help in tracing the literature and material of this species.

SHERRIN'S SPHAGNUM HERBARIUM

Mr. W. R. Sherrin A.L.S. has presented to the Herbarium of the Royal Botanic Gardens, Kew, his valuable collection of bog-mosses (*Sphagnum*). The material occupies two standard-sized cabinets and the specimens, representing approximately 4350 separate collectings, are mounted on 1360 sheets. The specimens have been determined with the utmost care and largely formed the basis of Mr. Sherrin's " Illustrated Handbook of the British Sphagna", published by Taylor and Francis, London, in 1927.

The Sphagna are of considerable interest to botanists for a number of reasons and they also have economic importance. The genus is a large one (Warnstorff, in 1911, accepted 342 species some with a considerable number of varieties and forms) and occurs all over the world but the species thrive best in the damp, humid climates of the temperate zone in Europe, Asia, and America. Typically, the species grow in bogs and other wet places where the water is more or less acid, often very highly acid. Their dead remains play an important part in the building up of the masses of peat filling such bogs. Peat, of course, is important as a source of fuel. Newly dried *Sphagnum* has been used for packing material, for making coarser kinds of paper, in horticulture, and in the manufacture of molasses feeds for livestock.

Taxonomically the genus is a difficult one. The differences used as key characters are often either not easy to define precisely in words or are microscopic. This enhances the value of such a collection as that made by Mr. Sherrin and which will at Kew be accessible to *bona fide* research students.

STUDIES IN THE ERICALES : VII.*

Illustrations of four scarce Asiatic Gaultherias.

H. K. Airy Shaw

The drawings here reproduced were intended to accompany my article on the Classification of the Asiatic species of *Gaultheria* in *Bull. Misc. Inform.*, Kew, **1940,** 306–330 (1941), but could not be published at the time owing to war conditions. It is thought that it is even now worth publishing them, since the species concerned are probably represented in very few herbaria. For completeness, references have been given to figures (where available) of the remaining species of Sect. *Brossaeopsis*. The numbers prefixed to each correspond to those in the above article.

Section **Brossaeopsis** *Airy Shaw*, *l.c.* 307, 309.

Series Dumicolae *Airy Shaw* in *Hook. Ic. Plant.* **33,** sub t. 3207 (1933), et in *Bull. Misc. Inf.*, *l.c.* 307, 310.

1. G. codonantha *Airy Shaw*.—Icones : *Hook. Ic. Plant.*, *l.c. supra* ; *Bot. Mag.* **159,** t. 9456 (1936).

2. **G. abbreviata** *J. J. Sm.* in Fedde, *Rep. Spec. Nov.* **35,** 292 (1934) ; Airy Shaw, *l.c.* 311.—Icon : **fig. 1.**

3. G. dumicola *W. W. Sm.* in *Notes Roy. Bot. Gard. Edinb.* **9,** 106 (1916) ; Airy Shaw, *l.c.* 312, et *Kew Bull.* **1948,** 109 (1948).

var. petanoneuron *Airy Shaw* in *Hook. Ic. Plant.* **33,** t. 3206 (1933) et in *Bull. Misc. Inform. l.c.* 312.—Icon : *Hook. Ic. Plant. l.c.*

var. aspera *Airy Shaw* in *Bull. Misc. Inform. l.c.* 312, et *Kew Bull.* **1948,** 110 (1948).

4. **G. notabilis** *Anthony* in *Notes Roy. Bot. Gard. Edinb.* **18,** 18 (1933) ; Airy Shaw, *l.c.* 312–13. Icon : **fig. 2.**—I am indebted to the Regius Keeper, Royal Botanic Garden, Edinburgh, for the loan of the type specimen, from which the flowers were drawn.

Series Atjehenses *Airy Shaw*, *l.c.* 307, 313.

5. **G. atjehensis** *J. J. Sm.* in Fedde, *l.c.* 293 ; Airy Shaw, *l.c.* 313.—Icon : **fig. 3.**—I am indebted to the Director of the Rijksherbarium, Leiden, for the loan of the type specimen, and to my sister, Mrs. E. Milne-Redhead, for making the drawing.

Section **Eugaultheria** *Airy Shaw*, *l.c.* 308, 318.

Series Trichophyllae *Airy Shaw*, *l.c.* 308, 320.

5. **G. dolichopoda** *Airy Shaw*, *l.c.* 321.—Icon : **fig. 4.**

*Continued from *Kew Bull.* **1948,** 110 (1948).

Fig. 1, *Gaultheria abbreviata* J. J. Sm. 1, flowering branch, × ⅔ ; 2, leaf, upper surface, × ⅔ ; 3, portion of leaf, lower surface, showing indumentum, × 4 ; 4, flower, with bracteoles, × 3 ; 5, capsule, × 3. (SUMATRA : Padangsche Bovenlanden, Gunong Singgalan, 2100 m., 16 Jan., 1913, *C. G. Matthew* sine num., Herb. Kew.).

Fig. 2, *Gaultheria notabilis* Anth. 1, leafy shoot, *natural size* ; 2, portion of leaf, lower surface, showing indumentum, × 4 ; 3, leaf and inflorescence, *natural size* ; 4, flower, showing bract and bracteoles (corolla and androecium fallen), × 3. (YUNNAN : near Tengyueh, *Forrest* 26722, type in Herb. Edinb., dupl. in Herb. Kew.).

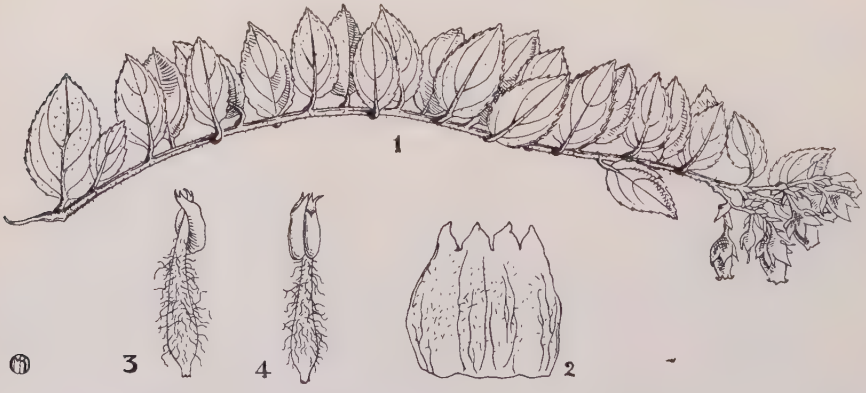

Fig. 3, *Gaultheria atjehensis* J. J. Sm. 1, flowering branch, *natural size* ; 2, corolla, opened out, from within, showing indumentum, × 4 ; 3, 4, stamens, abaxial and adaxial views respectively, × 10. (SUMATRA : Atjeh, Boer ni Telong, *Frey Wyssling* 27, type in Herb. Lugd.-Bat.).

Fig. 4, *Gaultheria dolichopoda* Airy Shaw. Entire plant (?), *natural size*. (S. E. Tibet : Tsangpo Gorge, near Sechen La, *Kingdon Ward* 6331, type in Herb. Kew.).

Farsetia socotrana *B. L. Burtt*, nom. nov. *F. prostrata* Balf. fil. in Proc. Roy. Soc. Edinb. **11,** 500 (1882)—non *F. prostrata* Hochst. in Flora, **31,** 176 (1848) in adnot.

Socotra. In locis arenosis, *Balfour, Cockburn & Scott* 205.

The repetition of the specific epithet *prostrata* in this genus is probably due to the fact that *F. prostrata* Hochst. has been omitted from *Index Kewensis*. Hochstetter's plant is often quoted in literature as *Matthiola prostrata* Hochst. et Steud, *nomen nudum*, but its valid publication under *Farsetia* seems to have escaped notice.

F. stenoptera Hochst., which was another *nomen nudum* when originally published (in Flora, **24,** pt. 1, Intell. 41 : 1841) was also described at the same time as *F. prostrata*, and thus antedates *F. grandiflora* Fourn. (in Bull. Soc. Bot. Fr. **11,** 55 : 1864) with which it is generally thought to be conspecific.

B. L. Burtt.

Narenga fallax (*Balansa*) *Bor*, comb. nov.

Saccharum fallax Balansa in Jour. de Bot. **4,** 80 (1890).

Erianthus chrysothrix Hack. in Oesterr. Bot. Zeitsch. **41,** 6 (1891).

Saccharum longifolium Munro ex Benth. in Journ. Linn. Soc. **19,** 66 (1881) ; nomen nudum.

Eriochrysis longifolia Munro l.c. : nomen nudum.

Erianthus longifolius (Munro) A. Camus in Lecomte, Flor. Gen. Indo-Chine **7,** 246 (1922).

Erianthus fallax (Balansa) Ohwi in Bull. Tokyo Sci. Mus. (1947) 2.

The correct name and synonomy of this well-known grass from South-East Asia are as stated above.

N. L. Bor.

REVIEW.

Collingwood Ingram, Ornamental Cherries, pp. 259. 8 coloured plates, 40 photographs and black & white figures. London, Country Life Ltd., (1948). Price 30/-.

This book deals with the deciduous cherris (subgenus *Laurocerasus* being omitted) and includes species of botanical interest as well as those of accepted decorative value, but excludes the varieties grown commercially for fruit. It is divided into three parts : (1) 70 pages devoted to the history, literature, and cultivation, (2) 122 pages dealing with the species in cultivation in this country, and (3) 50 pages on the horticultural varieties of " Japanese " cherries.

Mr. Ingram is a keen horticulturist who has assembled a fine collection of cherries in his garden, and his book contains a great deal of information; but to describe it as an " authoritative monograph "—as is done on the wrapper—is misleading, to say the least.

The taxonomy of subgenus *Cerasus* is beset with difficulties, and Koehne's classification, published in 1912, has long awaited critical revision. Mr. Ingram has proposed various taxonomic changes, and gives a " Revised Classification of the Deciduous Cherries", but judged from a botanical standpoint his work is very disappointing, and it is evident that much remains to be done before an adequate taxonomic account of the group can be prepared.

J. R. S.

THE ELDER TREE (SAMBUCUS NIGRA L.) AS A SOURCE OF PITH, PEGWOOD AND CHARCOAL, WITH SOME NOTES ON THE STRUCTURE OF THE WOOD.

C. R. METCALFE

Introduction.

The elder tree (*Sambucus nigra* L.), which occurs chiefly in central and southern Europe, is widely distributed in England where it thrives on waste land and in woods on many kinds of soil. It grows most vigorously in shady places, sometimes forming a definite shrub layer in woodlands, particularly on chalky soils. It also occurs in more exposed positions on chalk downs, but here it never attains the luxuriant growth which is possible in copses and woods.

Landowners, foresters and farmers generally regard elder as a plant of little value. Indeed the tree is quite commonly cut down and destroyed by burning, an operation which has to be frequently repeated because new shoots freely and quickly arise from old stumps. There is, moreover, in some parts of the country, a prejudice against using the timber as firewood, in spite of the fact that it burns well even when only partly dried. It will, therefore, be of interest to recall the various ways in which different parts of the plant can be used. This applies especially at the present time when we cannot afford to overlook potential uses for any home-grown raw material.

It is well known that the flowers, leaves and bark have been used in medicine for various purposes, but, in spite of a reminder from Grieve (A Modern Herbal 1931) that the botanist and physician Boerhaave never passed an elder tree without recognizing its curative properties by raising his hat, the plant has now largely lost its reputation amongst medical practitioners. The berries are commonly used in country districts to prepare elderberry wine. The present article is not, however, concerned chiefly with the uses of the flowers and fruits, but rather with certain special purposes for which the wood and pith of the plant are peculiarly suitable and for which they are still employed on a commercial although somewhat restricted scale. These uses of the wood and pith of elder were investigated at Kew during the second world war.

Elder the source of watchmaker's pegwood.

Grieve rightly describes the wood of old elder trees as white, close grained and easily cut and polished. It has hence been valued for making skewers, shoemakers pegs, various turned articles as well as combs and mathematical instruments. Although it is now probably used for these purposes only to a limited extent, one of the special merits of elder wood is its suitability for making sticks of so-called pegwood used by watchmakers and others who are concerned with delicate instruments. Pegwood usually comes on the market in the form of small bundles of sticks, each stick being about 15 cm. long and 5 mm. or occasionally more in diameter.

Satisfactory pegwood can be prepared only from a relatively close grained timber which does not splinter easily and contains no resin. Home grown timbers with these properties are by no means plentiful. The wood of the spindle tree (*Euonymus europaeus* L.) has often been used, but reports received indicate that pegwood made from elder and spindle respectively are of equally good quality and both definitely superior to that made from maple (*Acer* spp.). Elder, however, has the advantage over spindle that the wood is more easily obtainable and available in larger quantities.

Pegwood can be best prepared from small logs derived from fully mature, thick stems and branches of the elder tree. Relatively fast grown material from woodlands is the most satisfactory, as this possesses long internodes where the grain is straight and from which knots are absent. Even so there is a considerable amount of waste wood left over after the straight grained internodal portions suitable for pegwood have been selected and cut out. The waste can, however, be used as firewood or for turning small ornamental objects. Stunted trees from exposed positions frequently have shorter internodes and more crooked branches than those from woodlands. Material of this kind is of little value for making pegwood.

The logs are cut by means of a band saw, while still " green " or unseasoned, into rectangular portions about 10 cm. long and some 6 mm. square in cross section. The rectangular pieces are subsequently made cylindrical by suitable machines of which several types have been used. The pegwood is then dried in a current of warm air before the sticks are tied up in bundles ready for the market. A considerable quantity of pegwood was made from elder in this way in Great Britain during the second world war when supplies from the continent of Europe were no longer available.

Elder wood as a source of charcoal.

High grade charcoal was prepared in Britain from elder wood during the second world war. The charcoal was of a hard, close grained type, and emitted a metallic " clink " if allowed to fall on a hard surface.

Elder as a source of pith.

It is well known that young elder stems, especially those which have been grown quickly in protected and shady localities, contain a large proportion of pith, which consists entirely of parenchymatous cells. In older and more woody stems and branches the proportion of pith is very much smaller. Elder pith is extracted in commercial quantities and marketed in bundles of about 12–20 sticks each of which is about 10 cm. long.

Sticks of elder pith are commonly used in botanical laboratories for holding small specimens, whilst sections of them are being cut for examination with the microscope. Many botanists, will, however, learn with surprise that elder pith is of even greater interest to watchmakers and others who make or repair delicate instruments. It is used to manipulate small spindles and similar objects. It is also said to have been used for

polishing. In spite of the quantities of elder available in Great Britain, it was customary for elder pith to be imported from France before the second world war. The extraction and preparation of the pith was mainly a peasant industry, although the marketing and distribution were undertaken by comparatively large firms. When French sources were no longer available during the last world war, the preparation and marketing of elder pith was undertaken in this country.

Sources of raw material for preparing pith and pegwood.

In order to facilitate the production of elder pith and pegwood, an investigation into the best sources of raw material and into the possibility of introducing pruning methods which would increase the proportion of pith were undertaken at Kew, during 1941 and the next few years.

It soon became clear that elder trees growing in exposed situations, for example on chalk downs, are of little value as a source of pith. Special attention was, therefore, devoted to elder which formed a shrub layer in woodlands since this was found to be the most suitable material from which to obtain pith as well as pegwood.

The long, straight, vertical stems which arise from the lower branches or bases of fairly mature trees usually contain the best pith. It is also most important to ensure that stems are collected for the extraction of pith only whilst they are at the most suitable age. If the stems are cut when very young, and the pith cells are still alive, it is a simple matter to extract the pith because very little secondary xylem will have developed, thus making it easy, with a sharp knife, to pare off the outer tissues from the core of somewhat gelatinous pith. Pith prepared in this way is quite useless, however, since it contracts very considerably and becomes evil-smelling and quickly decomposed. With much older shoots, in which a considerable amount of secondary xylem has developed, it is much more difficult to extract the pith because the bark and wood cannot readily be cut away from around it. When once extracted, however, pith derived from these shoots consists of dead cells and does not become decomposed when exposed to the air. It is, in fact, comparable with the best quality pith which was imported before 1939.

Observations made on numerous elder trees both at Kew and in north Wiltshire demonstrated that a certain proportion of vigorous young shoots, generally less than one year old, are killed during the winter for some reason which is not fully understood. Many of these shoots appeared to be those which arise rather late in the growing season, and in which very little wood is developed before the winter comes on. It seems quite likely that the death of these shoots is due to cold weather affecting them before they are fully hardened. Whatever may cause them to die, the most important fact about these shoots is that the wood and bark become almost or completely detached and therefore easily separable from the central core of pith. In fact the wood and bark are so loose that they can often be removed with the fingers, although a pen-knife frequently facilitates the operation. Pieces of pith of excellent quality and up to 6 ft. or more in length were frequently extracted from stems of this kind. Although it is suspected that the death of these shoots and the subsequent loosening of the pith is caused primarily by

cold weather, it should be mentioned that there was sometimes evidence, at the boundary between wood and pith, of decay due to invasion by a fungus or attack by an insect or other animal organism. It was by no means clear, however, if or to what extent either of these organisms was responsible for the separation of the wood from the pith. Dead stems of this kind with loose pith are especially valuable, and pruning treatments designed to stimulate their formation are described below.

Methods of extracting the pith from healthy stems.

The observations so far recorded clearly show that the most satisfactory pith developes in stems from plants growing in sheletered places in woodlands. The actual separation of the pith is, however, by no means easy to achieve unless the stems are of the dead kind described in the preceding paragraph. Attempts were therefore made to discover the most satisfactory method of extracting the pith from healthy stems. It was found, in preliminary experiments, that the pith can sometimes be extracted very quickly and effectively from short lengths of stem with a cork borer, but, for every success obtained by this method, there were several failures because the pith is so easily broken. The tests indicated, however, that a pith extracting machine which operates on the same principle might be devised, It was also found that, although the wood and bark of short lengths of stems containing well developed pith split longitudinally when placed in an oven at 56°C. for some hours, the ease with which the pith could then be extracted was not greatly increased. Attempts to soften the woody parts of pithy stems by boiling or soaking in water or caustic soda solutions were of no avail, nor was any success obtained by burying stems in moist ground or by treating them by methods which are commonly employed to promote the decomposition of vegetable refuse in a compost heap. To all of these treatments the woody part of the elder stem proved to be highly resistant.

Later it is shown how surgical treatments can be used to stimulate the development of young shoots in which a high proportion of pith is formed within a cylinder of unusually thin layers of wood and bark. From stems of this kind the pith can be readily extracted by cutting freshly collected shoots into pieces about 10 cm. long from which the wood and bark can be easily removed by means of a safety razor blade fitted to a suitable handle. It is far more difficult to extract the pith from similar shoots after they have been allowed to dry. Using freshly collected material, it was found possible, in an hour, to prepare at least 7 bundles of pith of the type normally sold in commerce. The process would have been accelerated considerably if a suitable machine had been available to cut the stem into 10 cm. lengths.

Surgical treatments which stimulate pith formation.

Preliminary experiments showed that if old branches, consisting mostly of wood and containing but little pith, are cut back drastically at any time between May and October, new shoots at once arise from lateral buds. Provided the plants are growing in a sheltered-and preferably shady place, the young branches are usually straight, grow vertically upwards and contain well developed pith. By treating an old and most unpromising elder tree in this way it is possible to induce the formation of abundant, pith-bearing shoots.

Having ascertained that the growth of pithy shoots could be stimulated by pruning, attention was next directed towards discovering treatments which would lead to the formation of dead shoots with loose pith of the type already described. The effect of removing a complete girdle of bark from the base of pithy shoots was first investigated as it was anticipated that this would interfere with the translocation of food sufficiently to cause the shoots to die. No such result was secured, however, and the treated shoots continued to thrive with the same apparent vigour as comparable shoots from which no girdle of bark had been removed.

It was next demonstrated that removing the terminal and lateral buds together with the leaves from an actively growing shoot caused the latter to die from the apex downwards. If, however, the buds and leaves were removed early in the summer the treatment was of no value because the pith quickly decayed. On the other hand, when shoots were similarly treated later on in the summer, many of them died during the ensuing winter, the pith becoming loose and easily separable from the woody tissues. Long pieces of pith of reasonably good quality were extracted from some of the shoots, but the pith from others was partly decomposed, apparently by fungal attack. Results which were still more promising were secured when the buds and leaves were removed from shoots of the current season's growth in early October. For example, shoots treated on October 2nd, when subsequently examined on October 20th were found to be dying back from the apex, the pith being quite loosely enclosed within the woody tissues in the dead portions. By December 24th of the same year some of the treated shoots were more completely dead and from these quite long pieces of pith could be extracted. It was also found to be relatively simple by using the technique described at the end of the last section, to remove the pith from treated shoots which had not yet been killed.

These experiments show conclusively that, to ensure a regular supply of stems suitable for the extraction of pith on a commercial scale, it is first necessary to prune the trees drastically during the early summer. The terminal and lateral buds as well as the leaves should then be removed, at the end of September or beginning of October, from the vigorous, straight, pith-bearing shoots which are formed as a result of the summer pruning. From those of the young stems which die during the ensuing winter the pith can generally be removed with the greatest of ease. Even those young shoots which do not die constitute a type of material from which it is simple to extract the pith provided the wood and bark are removed without becoming too dry. The pith itself, when prepared from shoots of this kind, is generally of good quality since it usually consists of dead cells which have not decayed or become disorganised by fungal attack.

Structure of elder wood.

The following brief description of the structure of elder wood has been drawn up chiefly to facilitate the identification of sticks of pegwood made from this material. The information concerning its structure may also prove to be of interest to those who are concerned with the relationship between the structure of timber and its potential uses, especially since so

few home-grown timbers are known from which really satisfactory pegwood can be prepared. A comparison of figs. (1 and 2 with 3 and 4) shows how elder pegwood can be at once distinguished from pegwood prepared from spindle wood.

Microscopic Features

Wood somewhat variable in colour, unseasoned specimens commonly pale yellowish-brown or greenish-brown ; fine grained. **Growth rings** readily visible under a lens, the boundaries being marked by very narrow zones in the early wood where vessels are rather more numerous and slightly larger than those elsewhere. **Vessels** of the latewood not individually conspicuous with a lens, evenly distributed and mostly in somewhat irregular tangential to oblique groups. Solitary vessels usually infrequent, but more numerous in some specimens than in others. **Rays** clearly visible on transverse surfaces as crowded lines, rather lighter in colour than the ground tissues of the wood ; also conspicuous on radial but not on tangential surfaces. Scent of freshly cut "green" wood unpleasant.

Microscopic Features (Figs. 1 and 2)

Vessels 32–112 (mean 59) μ in tangential diameter ; elements 177–645 (mean 385) μ long ; about 49 per sq. mm. ; mostly in oblique or approximately tangential groups, each group commonly consisting of radial pairs or short radial multiples of up to about 5 elements ; solitary vessels infrequent in some specimens but more numerous in others ; vessel groups and multiples consisting of fewer elements in specimens with relatively frequent solitary vessels than in others. An almost continuous but very narrow zone of slightly larger and more crowded vessels present in the early wood of each annual ring. Perforations simple, very oblique. Walls of vessels thin, those between contiguous vessels frequently almost straight, thus making some of the elements appear approximately rectangular in transverse sections. Intervascular pits transitional to opposite, crowded ; individual pits with small circular or oval apertures, the latter being horizontal to oblique. Pits to ray cells larger, less crowded and more elongated horizontally than the intervascular pits ; simple or with very inconspicuous borders.

Fibres. Ground tissue consisting almost wholly of irregularly arranged fibres with moderately thick walls, the lumen being much wider in the middle part of each element than at the tapering ends ; pits rather infrequent, slit-shaped and apparently simple. Fine spiral striations noted in a few of the fibres. Fibre cells 435–1290 (mean 889) μ long.

Parenchyma. Very scanty.

Rays usually about 5 per mm. ; mostly 3–4 cells wide and up to about 42 cells high, but occasionally much taller owing to the fusion of rays ; heterogenous, consisting of low and upright cells, most, but by no means all, of the upright cells being at the margins of the rays. Occasional, short, uniseriate rays, most of which consist wholly of upright cells, also present.

Growth rings. Clearly defined, the boundaries between them being marked by zones, usually 3 or 4 cells wide, each consisting of very small, thin-walled, rectangular elements.

Plate 3

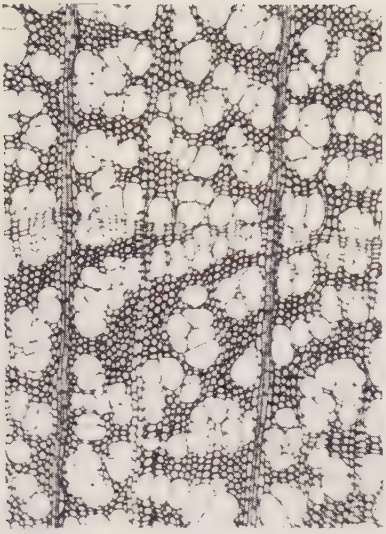

Fig. 1

Fig. 2

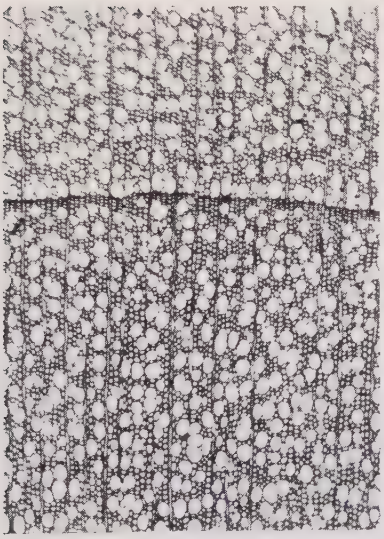

Fig. 3

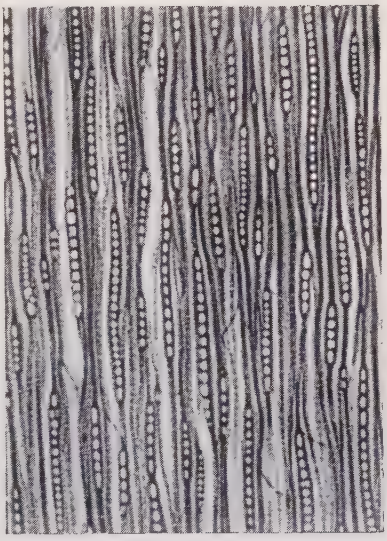

Fig. 4

1. *Sambucus nigra.* Transverse section of wood × 50
2. *Sambucus nigra.* Tangential section of wood × 85
3. *Euonymus europaeus.* Transverse section of wood × 50
4. *Euonymus europaeus.* Tangential section of wood × 100

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SUMMARY.

Straight grained portions of the common elder (*Sambucus* nigra) have proved to be particularly suitable for the preparation of watchmakers pegwood and certain grades of charcoal, whilst the pith from young stems, collected at the end of the first season's growth, is used by watch- and other instrument-makers as well as in botanical laboratories. The source of the best types of raw material for preparing pith and pegwood is discussed, and methods of extracting the pith are described. It is most easily obtained from certain shoots which die during the winter following the first season's growth. The pith becomes more or less separated from and lies loosely within the bark and wood of stems which have been killed in this way. Pieces of pith up to about 6 ft. or more in length can be removed from these shoots without difficulty. Pith can also be extracted fairly quickly from living shoots freshly gathered at the end of the first season's growth, provided the stems are cut into short lengths before attempting to remove the outer tissues. Surgical treatments have been devised which (i) stimulate the development of straight, pith-bearing shoots and (ii) cause a proportion of the shoots to die during the winter and thus make them particularly suitable for the extraction of pith. The cultivation of elder for the production of pith, pegwood and timber suitable for making small ornamental objects might profitably be undertaken as a small-scale local industry.

Appendix

THE JERUSALEM ARTICHOKE (HELIANTHUS TUBEROSUS L.) AS A SOURCE OF PITH.

Pith of comparable, but sometimes rather inferior quality can also be obtained from stems of the Jerusalem artichoke (*Helianthus tuberosus* L.) This material has two advantages over elder pith. Firstly it can be obtained as a bye-product from crops of artichokes grown for the sake of their edible tubers. Secondly the less woody character of the outer tissues of artichoke stems enables the pith to be extracted with greater ease.

Its main disadvantage lies in the fact that, unless the stems are gathered immediately at the end of the growing season and stored under suitably dry conditions, the pith is very liable to undergo decay. It is generally preferable, if circumstances permit, to extract the pith as soon as the stems have been gathered. Although, as is well known, Jerusalen artichokes can be cultivated on almost any type of soil, the tallest stems containing the most abundant pith arise from plants grown on low-lying, moist land. The best land for the production of pith is not, therefore, quite the same as that on which artichokes are usually raised commercially for the sake of their tubers.

Artichoke stems must be allowed to reach full maturity before attempting to remove the pith. It will then be found quite easy to extract it by cutting the stems into 10 cm. lengths from which the outer tissues can be removed with a razor blade mounted on a suitable handle. It will be found much more difficult to extract pith from material which has been stored in a dry shed for a period after being gathered. When handling dried stems of this kind it is first necessary to soak the stems for a time in hot water. This treatment restores their freshness, after which the outer tissues can be removed from short lengths of stem in the manner already described.

Ferdinandia Welw. ex Seem. [Bignoniaceae], an unintentional orthographic error. The generic name for these beautiful Bignoniaceous trees, originally taken from Dr. Welwitsch's MS, was inadvertently published by Seemann in 1865 (see references given below) as *Ferdinandia*. The name was chosen in honour of H.M. King Fernando of Portugal, who in English is known as King Ferdinand. This error was pointed out by Seemann the following year. I quote his statement from page 123 of the Journal of Botany for 1866 :—" From the absence of Dr. Welwitsch in Paris while the sheet describing his new *Bignoniaceae* was passing through the press, the name FERNANDOA was misprinted *Ferdinandia*." Here therefore is a case of an unintentional orthographic error which, under Art. 70 of the International Rules, should be corrected.

So far, so good, but the matter was again confused by the publication of a further note by Seemann in the Journal of Botany for 1870 (*l.c.*). In it Seemann states :—" It should be added that on the publication of the genus the name was misspelt ; it should have been 'Ferdinandoa'." This third spelling of the generic name was again an error. Reference to the index (Journ. Bot. **8,** 403) provides the necessary proof ; the entry is :—" Fernandoa (by error, Ferdinandoa) magnifica, Seem., 280." A further reference to this error is found in Journ. Bot. **9,** 81 (1871).

It is unfortunate that the original erroneous spelling has been adopted in subsequent important works, e.g., Hiern, in Cat. Afr. Pl. Welw., **1,** 792 (1900) ; Sprague in Dyer, Fl. Trop. Afr. **4** (2), 516 (1906). However, Sprague (Kew Bull. 1929, 44 : 1929) made it clear that the generic name should be **Fernandoa.**

Bentham and Hooker mention the genus in the synomy of *Heterophragma* DC., but alter the spelling to *Ferdinanda*, which is yet another version of the name, and a later homonym of *Ferdinanda* Lag., whilst Baillon (l.c.). invents a fifth variant, *Fernandia*, which is taken up by K. Schumann (l.c.) Neither of these spellings has any nomenclatural standing.

The synonymy therefore is :—

Fernandoa *Welw. ex Seem.* [sphalm. *Ferdinandia*] in Journ. Bot. **3,** 330 (1865), et (Fernandoa) **4,** 123 (1866), et [sphalm. *Ferninandoa*] **8,** 280 (1870), et (Fernandoa) **9,** 81 (1871).

Ferdinanda Benth. et Hook.f. Gen. Pl. **2,** 1047 (1876), pro syn., non Lag. (1816).

Fernandia H. Baill. Hist. Pl. **10,** 47 (1891) ; K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. IV. **3B,** 243 (1895).

The correct names for the two species at present known would appear to be as follows :—

1. **Fernandoa ferdinandi** (*Welw.*) *Milne-Redhead*, comb. nov.

Bignonia ferdinandi Welw. Apont. Phyto-geogr. 584 (1858).

Ferdinandio (!) *superba* [Welw. ex] Seem. in Journ. Bot. **3,** 330 (1865).

Ferdinandoa (!) *superba* Seem. in Journ. Bot. **8,** 280 (1870).

Fernandia superba (Welw. ex Seem.) Baill. Hist. Pl. **10,** 48 (1876).

Fernandia fernandi K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. IV. **3B,** 243 (1895).

Fernandia ferdinandi (Welw.) K. Schum. in Engl. Bot. Jahrb. **33,** 332 (1903), pro parte, quoad syn.

Heterophragma ferdinandi (Welw.) Britten in Journ. Bot. **33,** 75 (1895).

2. **Fernandoa** [sphalm. *Ferdinandoa*] **magnifica** *Seem.* in Journ. Bot. **8,** 280 (1870), et (*Fernandoa*) **9,** 81 (1871).

Heterophragma longipes Bak. in Kew Bull. 1894, 31 (1894).

[*Fernandia ferdinandi* (non Welw.).—K. Schum. in Engl. Bot. Jahrb. **33,** 332 (1903), pro parte, excl. syn.]

Ferdinandi magnifica [Seem.] Sprague in Dyer, Fl. Trop. Afr. 4(2), 517 (1906).

In passing, it may be mentioned that there are two other genera of flowering plants with similar names, *Ferdinanda* Lag. (1816) in the *Compositae*, and *Ferdinandea* Pohl (1827) in the *Rubiaceae*. As the difference between these names lies in their termination, the names must be regarded under Art. 70 of the International Rules as distinct even though they differ by only one letter. There are no grounds under this rule for treating *Fernandoa* as a later homonym.

E. Milne-Redhead.

Plant Communities*. A branch of science in which there are active developments necessitates the publication of frequent new textbooks. America is better off than most countries in the provision made for students of ecology and the book here noticed is primarily intended for use in that country. It contains much information on synecology but largely ignores the methods and concepts developed by non-American ecologists. In the long list of references there are only two or three to the Journal of Ecology and the researches of British ecologists seem almost entirely unknown to the author. One would naturally expect American work to be emphasized and examples of vegetation to be taken from local communities but methods and concepts in the study of vegetation should be included in a text-book wherever they may have originated or the work is incomplete and to that extent misleading and unsatisfactory.

Nevertheless, there is much to recommend this " introduction " to one branch of ecology. It is well illustrated and has a good index. It covers much of the ground adequately, especially that dealing with the physical factors of the environment. A chapter that will probably have a wide use deals with the present distribution of climaxes in North America. This presents very concisely a survey of vegetation throughout the continent. The last chapter, concerned with applications of ecology in forestry, agriculture, water supply, and what is called " landscaping", may also be recommended as a fair indication of ecology in the service of man. Some subjects, however, appear to be relatively neglected. Competition, for example, is dealt with vaguely in one and a half pages (apart from a few causal references).

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*The Study of Plant Communities, an introduction to plant ecology, by H. J. Oosting. San Francisco, W. H. Freeman and Company, 1948, 389 pp. $4.50

The Birds of Tropical West Africa—Volume 6.

by D. A. Bannerman

Here is another volume of this beautiful work on the West African bird-fauna. The last one, volume 5, was published eight years ago, after which time the war prevented both research and publication of this book which contains accounts of the Titmice, Crows, Starlings, White-eyes, coloured plates each containing 2 to 9 figures of birds, besides numerous sketches in black and white in the text. The description of the species, their nests and eggs, food and habits, are as perfect as can be made and exceptionally interesting.

An excellent foreword by Sir Bernard Bourdillon, formerly Governor of Nigeria, a keen and observant naturalist, opens the work. The next volume, no. 7, is to contain the rest of the Passeres, and the Weaver birds. The final volume will include additional information received since the publication of the earlier ones.

It is rare that a work on Natural History of such value and beauty is published by the Secretary of State for the Colonies nowadays, and one wishes that more of this class of work could be done.

H. N. Ridley.

International Rules of Botanical Nomenclature.—We are asked by the publishers to draw attention to their re-issue of the useful compendium of the International Rules* originally published in *Brittonia*, **6,** (1), 1–120 (1947), and shortly afterwards re-issued, in a limited edition, as a separate publication. This is now made available to a wider public. It comprises (pp. 4–30) the English text of the official third (1935) edition of the Rules, with the additions and emendations adopted at the 1935 Congress at Amsterdam interpolated in **bold-face** type, in their appropriate places, A number of explanatory editorial notes have been included. Four appendices occupy pp. 31–113, by far the greater part being taken up by Appendix III, *Nomina Generica Conservanda*, and an exhaustive index thereto. A Supplement, *Species lectotypicae generum Linnaei*, occupies pp. 114–118, and a general index concludes the work.

This admirably clear presentation of the International Rules and Appendices, though not of course an official edition, will form a valuable working tect-book for the Taxonomy Section of the Seventh International Botanical Congress at Stockholm in 1950.

**International Rules of Botanical Nomenclature* . . . . compiled from various sources by W. H. Camp, H. W. Rickett and C. A. Weatherby. (Unofficial Special Edition.) Second Printing, reproduced by Offset and published by The Chronica Botanica Co., Waltham, Mass., U.S.A., for the New York Botanical Garden and the American Society of Plant Taxonomists. 1948. Price $3.50. (London : Wm. Dawson & Sons, Ltd., W.C.2.).

ALUMINIUM IN THE PLANT WORLD

E. M. Chenery.

Part I, General Survey in Dicotyledons

In most plants aluminium is usually found in very minute quantities, but it has been known for a long time that certain species take up this element in comparatively large amounts. These species were first ([8, 14]) called "Aluminium-plants" and more recently ([12, 16]) "Aluminium-accumulators"; to be regarded as such, they should store aluminium to the extent of 1,000 parts per million (mg. per kilo) or more of their dried leaves as against a normal content of less than 300 parts per million.

The reviews of the occurrence and significance of aluminium in plants by G. E. Hutchinson ([10, 11]) stimulated the present writer to continue investigations on this subject, which were begun in 1934 ([3]). In this paper, these earlier results, together with those of a more comprehensive survey recently undertaken at Kew, will be presented in relation to taxonomy.

Diagnosis of Aluminium-Plants

As G. E. Hutchinson has recorded ([10]) the history of these plants in detail, only an outline of their diagnostic characters will be given here. There are three features which, if they occur in a plant, either singly or together, point to the likelihood of its being an aluminium-accumulator. These are as follows :—

1. Use of the plant (leaves or bark) as a mordant by native dyers, e.g., *Memecylon* and *Symplocos* spp. and one species of *Baccaurea*.
2. The leaves when dry are coloured a persistent yellowish-green, e.g., *Symplocaceae*, *Diapensiaceae*, *Melastomataceae*; a correlation first described by Hallier ([9]) but found independently by the writer ([3, 7]).
3. The fruits are bright blue in colour ([5, 7]) e.g., *Symplocos* spp., *Memecylon* spp., *Coccocypselum* spp., *Saprosma* spp., *Psychotria* spp.

The first feature brought the attention of botanists to this subject originally; the second opened up the field and ultimately accounted for most of the accumulating families, while the third feature has been, indirectly, the most productive as regards actual numbers of aluminium plants. Rapid advances were made in this study after the finding ([5]) of a simple method for the qualitative determination of aluminium in plant material, which is described below.

The "Aluminon" Test for Aluminium

About one square inch of crushed leaf material, placed in a test-tube with about 1 c.c. of "Aluminon" reagent, is heated for five minutes in a boiling water bath. A dark red colour indicates an aluminium accumulator. The reagent, which is quite stable, consists of 0·75 gm. "Aluminon" (ammonium aurine tricarboxylate), 200 gm. ammonium acetate, 15 gm. gum acacia, 189 ccs. concentrated hydrochloric acid A.R., dissolved separately, mixed and made up to 1,500 ccs. This reagent is very sensitive to both aluminium and iron but is unaffected by the iron, magnesium and phosphates in leaves and by the mercury on leaves treated with corrosive sublimate fungicidal solutions. Iron is very rarely accumulated in leaves above 350 p.p.m.—usually about 100 p.p.m., which cannot be detected in the above procedure. Only one iron

accumulator, *Duroia longifolia* (P. et E.) Schm., has been found in this survey. Contamination by iron salts is shown by deep purple colourations and only occurs in certain water plants.

Collection of Samples

Live leaves from blue-fruited plants were tested first, then herbarium material of blue-fruiting genera. Yellowish-green drying species were so frequently encountered in the search for blue fruits that attention was soon centred on plants which showed any signs of drying this colour (citron green to maize yellow according to the R.H.S. colour chart). The following may be cited as typical examples of aluminium-accumulators with leaves which dry yellowish-green :—*Phyllonoma* spp., *Ceratopetalum* spp., *Anisophyllea* spp., *Moutabea* spp., *Danais* spp., *Tutcheria* spp., *Tetrazygia* spp. Eventually all the available genera of the large aluminium-accumulating families were tested and also any hitherto untested families. Over 4,000 " aluminon " tests have been made and several thousands of herbarium sheets have been inspected for leaves which dry yellowish-green. Hallier (9) mentioned many species and families with this feature and suggested that they might contain large amounts of aluminium. Subsequent analyses showed that he was correct only in so far as the *Theaceae*, *Diapensiaceae*, *Vochysiaceae*, *Symplocaceae* and *Xanthophyllum* spp. were concerned. In the present survey 646 aluminium-accumulating species from 143 genera had leaves which dry more or less yellowish-green, while 113 species from 17 genera had similar leaves but were not accumulators. Of the 1133 aluminium-accumulating species with leaves which dry green, brown or black, those from 53 genera never showed the slightest signs of drying yellowish-green. Degree of insolation is almost certainly responsible for these variations, as the writer has repeatedly observed in Trinidad and British Guiana that those " aluminium plants " which grow in dense shade, e.g., *Clidemia* spp., *Miconia* spp., *Cephaelis* spp., *Psychotria* spp., never dry yellowish-green. Notes on herbarium sheets at Kew confirm this with respect to *Grumilea* spp., *Lasianthus* spp., *Gaertnera* spp., *Urophyllum* spp., *Praravinia* spp. Leaves of non-accumulators which dry yellowish-green might owe their colour to several causes, such as lime-induced chlorosis, nitrogen deficiency, water-logging or even old age.

Results.

There are five levels of aluminium content that are easily distinguished by the " aluminon " test, viz. :—

1. Above 10,000 p.p.m. the reagent turns an intense, almost opaque, crimson colour, e.g., *Symplocos* spp., *Faramea* spp., *Coussarea* spp., *Baccaurea* spp., *Aporosa* spp., *Vochysiaceae*, *Melastomataceae*.
2. Between 3,000 and 10,000 p.p.m. the reagent turns crimson, e.g., *Diapensiaceae*, *Theaceae*.
3. Between 1,000 and 3,000 p.p.m. the reagent turns scarlet, e.g., *Monimiaceae*, *Lauraceae*.
4. Between 300 and 1,000 p.p.m. the edges of the leaf fragments are stained crimson but the reagent is only slightly darker than its original orange colour, e.g., *Winteraceae*, *Cornaceae*.
5. From 0 to 300 p.p.m. no change is visible in the orange-coloured reagent, e.g., *Ericaceae*, *Vacciniaceae*.

Quantitative backing for the qualitative test was made for 83 species. All numerical data obtained in this study and elsewhere are recorded in the lists of aluminium plants deposited in the library of the Royal Botanic Gardens, Kew. It is interesting to mention here that the largest content of aluminium in any plant was found by von Faber (8) to be 72,300 p.p.m. in *Symplocos spicata* Roxb. This is followed by 66,100 p.p.m. found by the writer in the leaves of *Miconia acinodendron* (L.) Tr.

In the results recorded below the Kew Herbarium (Bentham and Hooker with additions) arrangement of families and genera is followed. Certain families not universally recognised are mentioned by name in brackets. In the fractions following family and generic names the numerator (left side of stroke) is the number of aluminium-accumulating species and the denominator is the number of species actually tested. Fractions immediately following names include all the species tested by the writer during the last 14 years, and subsequent fractions are the results of other workers. The fractions following family names do not include the genera subsequently mentioned in the text. In order to obtain the totals for any one family, all the figures following, which apply to that family, are added together. Data obtained by obsolete gravimetric methods in which aluminium is precipitated as hydroxide or phosphate are considered unreliable owing to serious risk of silica contamination ; much of the early data reviewed by Hutchinson (10) has been accordingly omitted. Where genera making a consecutive run in the Bentham and Hooker sequence, within a family, show negative results the Bentham and Hooker generic numbers are given and not the generic names.

Only two of the 6 spp. of solfatara plants found by von Faber (8) to be strong accumulators were confirmed in this respect at Kew. Since the soil in which they were growing was exceptionally acid (pH 1·0) these are considered not typical aluminium plants and have not been included in the lists. The *Ericaceae* shown by von Faber to be accumulators of aluminium in their roots when grown in solfatara soil are also considered atypical.

Aluminium in Dicotyledons

Ranunculaceae 0/18 (19), *Dilleniaceae* (incl. *Crossosomataceae*) 0/7, 0/2 (19) *Calycanthaceae* 0/1 (19), *Trochodendraceae* 0/1, *Cercidiphyllaceae* 0/1, *Lactoridaceae* 0/1, *Winteraceae* 0/7, *Magnoliaceae* 0/4, 0/4 (19), *Himantandraceae* 0/2, *Annonaceae* (incl. *Eupomatiaceae*) 0/6. *Menispermaceae* 0/3, *Lardizabalaceae* (incl. *Sargentodoxaceae*) 0/2, 0/2 (19), *Berberidaceae* 0/3 (19), *Nymphaeaceae* (incl. *Cabombaceae*) 0/4, 0/3 (19), *Sarraceniaceae* 0/1, *Papaveraceae* 0/2, 0/1 (19), *Fumariaceae* 0/2, *Cruciferae* 0/6 (19), *Capparidaceae* (9) 0/6, 0/1 (19) *Tovariaceae* 0/2, *Resedaceae* 0/3, *Cistaceae* 0/1.

Violaceae : 0/12, 0/7 (19), *Agation* (9) 0/4, *Amphirrhox* 3/4, *Rinorea* 0/5 0/1 (12), *Allexis* 2/2, *Canellaceae* 0/5, *Flacourtiaceae* (incl. *Cochlospermaceae*, *Bixaceae*) 0/5, 0/1 (19), *Pittosporaceae* 0/8, 0/1 (19), *Byblidaceae* (incl. *Roridulaceae*) 0/5, *Tremandraceae* 0/1, *Polygalaceae* 0/4, *Xanthophyllum* (9) 28/44, *Moutabea* (17) 3/3, *Diclidanthera* 3/3, *Barnhartia* 1/1, *Krameria* (*Krameriaceae*) 0/4, *Vochysiaceae*: *Callisthene* 3/3, *Qualea* (6) 6/6, *Erisma* 3/3, *Vochysia* (9) 78/78, *Salvertia* 1/1, *Erismadelphus* 1/1.

Trigoniaceae 0/4, *Frankeniaceae* 0/2, *Caryophyllaceae* 0/5, 0/3 (19), *Portulacaceae* 0/2, *Tamaricaceae* (incl. *Fouquieriaceae*) 0/3, *Elatinaceae* 0/2, *Hypericaceae* 0/2, 0/2 (12), *Guttiferae* 0/2, *Quiinaceae* 0/4.

Ternstroemiaceae (*Theaceae*)

Tribe I—*Rhizoboleae*, *Caryocar*, (*Caryocaraceae*) 0/4.

Tribe II—*Marcgravieae*; *Marcgravia* 0/3, *Norantea* 0/2, *Ruyschia* 0/2, *Souroubea* 0/1 (*Marcgraviaceae*), *Tetramerista* 0/1 (*Tetrameristaceae*).

Tribe III—*Ternstroemieae*, *Anneslea* 0/2, *Visnea* 0/1, *Ternstroemia* 7/89 *Adinandra* 21/24, *Archboldiodendron* 0/1, *Cleyera* 5/6, *Symplococarpon* 2/2, *Sladenia* 0/1, *Freziera* 12/16, *Eurya* 20/20, 2/2 ([19]), *Ternstroemiopsis* 1/1, *Pentaphylax* (*Pentaphylacaceae*) 2/2, 1/1 ([9]).

Tribe IV—*Saurauieae* ; *Actinidia* (*Actinidiaceae*) 0/2, *Saurauia* (*Saurauiceae*) 0/7, *Stachyurus* (*Stachyuraceae*) 0/4, 0/1.

Tribe V—*Gordonieae* ; *Franklinia* 0/1, *Stuartia* 5/5, 1/1 ([19]), *Schima* 4/9, 0/1 ([19]), *Pyrenaria* 7/7, *Pelliciera* (*Pellicieraceae*) 0/1, *Gordonia* 11/27, *Laplacea* 14/15, *Piquetia* 1/1, *Tutcheria* 5/5, *Camellia* 25/25 ([4, 19]), *Stereocarpus* 1/1.

Tribe VI—*Bonnetieae* ; *Bonnetia* 0/4, *Ploiarium* 0/2, *Archytaea* 0/2, *Kielmeyera* 0/8, *Caraipa* 0/7, *Mahurea* 0/3, *Marila* 0/2, *Haploclathra* 0/2, *Poeciloneuron* 0/1, *Medusagyne* (*Medusagynaceae*) 0/1, *Strasburgera* (*Strasburgeraceae*) 0/1, *Rhodoclada* 0/1.

Dipterocarpaceae 0/4, *Ancistrocladaceae* 0/4, *Chlaenaceae* 0/13, *Malvaceae* (incl. *Bombacaceae*) 0/6, 0/1 ([19]).

Sterculiaceae 0/4, 0/1 ([19]), *Tiliaceae* (incl. *Elaeocarpaceae*, *Rhopalocarpaceae*) 0/21, 0/4 ([19]), *Scytopetalaceae* 0/6, *Brazzeia* 3/3.

Linaceae (incl. *Erythroxylaceae*) 0/9, *Humiriaceae* 0/9, *Malpighiaceae* 0/2, *Zygophyllaceae* 0/1, *Geraniaceae* (incl. *Tropaeolaceae*, *Oxalidaceae*, *Limnanthaceae*) 0/2, 0/10 ([19]), *Rutaceae* 0/2, 0/4 ([19]), *Simaroubaceae* (incl. *Brunelliaceae*, *Cneoraceae*, *Irvingiaceae*, *Picrodendraceae*, *Koeberliniaceae*, *Surianaceae*) 0/12, 0/1 ([19]), *Ochnaceae* 0/5, *Burseraceae* 0/1, *Meliaceae* 0/1, *Chailletiaceae* 0/4.

Olacaceae (incl. *Erythropalaceae*) 0/23, *Leptaulus* (*Icacinaceae*) 4/4, *Gonocaryum* (*Icacinaceae*) 11/14, *Octoknema* (*Octoknemaceae*) 3/3.

Aquifoliaceae 0/4, 0/5 ([19]), *Cyrillaceae* 0/1.

Celastraceae (incl. *Dipentodontaceae*, *Hippocrateaceae*) 0/5, *Kurrimia* ([2]) 3/4, *Stackhousiaceae* 0/5, *Rhamnaceae* 0/1 ([19]), *Vitaceae* 0/1, 0/2 ([19]), *Sapindaceae* (incl. *Didiereaceae*) 0/6, *Pandaceae* 0/1, *Hippocastanaceae* (incl. *Bretschneideraceae*) 0/3, *Aceraceae* 0/4, *Staphyleaceae* 0/2, *Akaniaceae* 0/1, *Sabiaceae* 0/2 *Melianthaceae* (incl. *Greyiaceae*) 0/5, *Anacardiaceae* (incl. *Corynocarpaceae*) 0/4, *Coriariaceae* 0/1, *Moringaceae* 0/1, *Connaraceae* 0/2, *Leguminosae* (incl. *Caesalpiniaceae*, *Mimosaceae*, *Fabaceae*) 0/2, 0/19 ([19]), *Rosaceae* (incl. *Pomaceae*) 0/2, 0/25 ([19]).

Saxifragaceae (incl. *Grossulariaceae*, *Iteaceae*, *Parnassiaceae*) 0/13, 0/10 ([19]).

Tribe III—*Hydrangeeae*; *Hydrangea* (*Hydrangeaceae*) 7/14, 3/4 ([19]), *Pterostemon* (*Pterostemonaceae*) 0/1.

Tribe IV—*Escallonieae*; *Polyosma* ([2]) (*Escalloniaceae*) 38/41, *Phyllonoma* ([2]) (*Phyllonomaceae*) 4/4, genera 50 to 57, 0/18, *Spiraeanthemum* 1/10 *Aphanopetalum* 1/1.

Tribe V—*Cunonieae*; *Ceratopetalum* 4/4, *Schizomeria* 3/3, *Acrophyllum* 1/1, *Anodopetalum* 1/1, *Platylophus* 1/1, genera 66 to 68, 0/9, *Gillbeea* 1/1, *Platypetala* 1/1, (*Cunoniaceae*) 0/15, *Cephalotus* (*Cephalotaceae*) 0/1.

Crassulaceae 0/1 ([19]), *Droseraceae* 0/2, 0/1 ([19]), *Hamamelidaceae* (incl. *Barbeyaceae*, *Myrothamnaceae*, *Eucommiaceae*) 0/7, 0/3 ([19, 9]), *Bruniaceae* 0/1 *Haloragaceae* (incl. *Callitrichaceae*, *Hippuridaceae*) 0/5, 0/2 ([19]).

Rhizophoraceae 0/14, 0/1 ([19]), *Cassipourea* 0/10, *Anisophyllea* ([2]) 19/19, *Poga* 1/1, *Combretocarpus* 1/1.

Combretaceae 0/5, *Myrtaceae* (incl. *Lecythidaceae*) 0/11.

Melastomataceae

Tribe I—*Microlicieae*; *Eriocnema* 2/2, *Lithobium* 0/1, *Castratella* 1/1, *Bucquetia* 1/2, *Svitramia* 1/1, *Pyramia* 1/1, *Cambessedesia* 2/2, *Chaetostoma* 2/3, *Stenodon* 1/1, *Microlicia* 5/6, *Trembleya* 3/4, *Lavoisiera* 6/6, *Rhynchanthera* 3/4, *Siphanthera* 0/2, *Centradenia* 0/2, *Poteranthera* 1/1.

Tribe II—*Osbeckieae*; *Acisanthera* 0/2, *Desmoscelis* 1/1, *Heeria* 0/3, *Arthrostemma* 0/3, *Ernestia* 0/3, *Appendicularia* 0/1, *Microlepis* 2/2, *Nepsera* 0/1, *Comolia* 0/1, *Pterolepis* 0/2, *Macairea*, 1/3, *Sandemania* 0/1, *Pterogastra* 3/3, *Itatiaia* 1/1, *Pleroma* (*Tibouchina*) 59/65, 1/1 ([12]), *Loricalepis* 1/1, *Fritzschia* 0/2, *Brachyotum* 20/21, *Marcetia* 1/5, *Chaetolepis* 0/3, *Aciotis* 0/5, *Nerophila* 1/1, *Osbeckia* 7/8, *Afzeliella* 0/1, *Antherotoma* 1/1, *Dinophora* 0/1, *Dionychia* 3/3, *Otanthera* 3/3, *Tristemma* 4/6, *Melastoma* 7/7, 1/1 ([12]), *Dissotis* 10/17, *Dichaetanthera* 4/4.

Tribe III—*Rhexieae*; *Monochaetum* 0/12, *Rhexia* 4/4, 1/1 ([12]), *Pachyloma* 3/3.

Tribe IV—*Merianieae* ; *Huberia* 3/3, *Behuria* 1/1, *Acanthella* 0/1, *Opisthocentra* 1/1, *Axinaea* 4/5, *Meriania* 2/2, *Adelobotrys* 3/4, *Centronia* 4/4, *Graffenrieda* 1/1, *Calyptrella* 2/2.

Tribe V—*Oxysporeae* ; *Oxyspora* 4/4, *Cyphotheca* 0/1, *Barthea* 2/2, *Kendrickia* 0/1, *Petalonema* 0/1, *Allomorphia* 5/5, *Campimia* 0/1, *Phaulanthus* 4/4, *Blastus* 1/3, *Eisocreochiton* 1/1, *Ochthocharis* 2/2, *Veprecella* 0/4, *Rousseauxia* 1/1, *Driessenia* 2/3, *Anerincleistus* 4/4, *Pomatostoma* 2/2, *Creaghiella* 1/1, *Bredia* 1/3.

Tribe VI—*Sonerileae* ; *Sonerila* 0/8, *Sarcopyramis* 0/1, *Fordiophyton* 0/2, *Cincinnobotrys* 0/1, *Plagiopetalum* 0/1, *Phyllagathis* 3/5, *Amphiblemma* 0/2, *Gravesia* 2/2, *Cyanandrium* 2/2, *Calvoa* 0/3, *Salpinga* 0/2, *Bertolonia* 1/3, *Macrocentrum* 2/5, *Diplarpea* 0/1, *Monolena* 0/1, *Diolena* 0/1, *Triolena* 0/2,

Tribe VII—*Medinilleae* ; *Sakersia* 2/2, *Dicellandra* 0/1, *Marumia* 8/8, *Dalenia* 1/1, *Dissochaeta* 4/4, *Myrianthemum* 1/1, *Oritrephes* 1/1, *Anplectrum* 8/8, *Creochiton* 3/3, *Omphalopus* 3/3, *Poikilogyne* 1/3, *Prussiella* 0/1, *Medinilla* 0/16, *Hederella* 0/1, *Cephalomedinilla* 0/1, *Carionia* 1/3, *Pachycentria* 0/4, *Pogonanthera* 0/2.

Tribe VIII—*Miconieae* ; *Platycentrum* 1/1, *Leandra* 5/5, *Calycogonium* 1/1, 0/1 ([12]), *Pachyanthus* 1/2, *Tetrazygia* 5/5, *Charianthus* 1/2, *Pterocladon* 1/1, *Conostegia* 5/5, 1/1 ([12]), *Miconia* 61/67, 1/1 ([12]), *Pleiochiton* 0/5, *Tococa* 3/3, *Hormocalyx* 1/1, *Catacoryne* 0/1, *Heterotrichum* 2/2, *Anoectocalyx* 0/1, *Clidemia* 19/21, *Mecranium* 3/3, *Maieta* 1/2, *Microphysa* 1/1, *Myrmedone* 0/1, *Bellucia* 2/2, *Loreya* 2/2, *Stichianthus* 1/1, *Henriettea* 4/4, *Myriaspora* 2/2, *Henriettella* 1/1, *Mommsenia* 0/1, *Ossaea* 4/4.

Tribe IX—*Blakeeae* ; *Blakea* 1/10, *Topobea* 0/4.

Tribe X—*Astronieae* : *Astronia* 7/8, *Everettia* 1/1, *Pternandra* 9/9, *Plethiandra* 0/2, *Astrocalyx* 2/2.

Tribe XI—*Memecyleae* ; *Mouriria* 8/8, *Memecylon* 19/19, 2/2 ([12]), *Bamlera* 1/1, *Warneckea* 1/1, *Dactylocladus* 0/1.

Unplaced genera: *Allomaieta* 1/1, *Amphitoma* 1/1.

Lythraceae (incl. *Heteropyxidaceae*, *Punicaceae*, *Sonneratiaceae*) 0/8, 0/2 (19), *Crypteronia* (2), (*Crypteroniaceae*) 7/8.

Oliniaceae 0/3, *Onagraceae* 0/7 (19), *Samydaceae* 0/4, *Loasaceae* 0/2, *Turneraceae* 0/1, *Passifloraceae* (incl. *Malesherbiaceae*, *Actariaceae*) 0/5, *Cucurbitaceae* 0/2 (19), *Begoniaceae* 0/2, *Pentaphragmataceae* 0/2, *Datiscaceae* 0/2, *Cactaceae* 0/2, *Ficoidaceae* (incl. *Tetragoniaceae*) 0/3, 0/2 (19), *Umbelliferae* 0/16 (19), *Araliaceae* 0/5, 0/9 (19), *Torricelliaceae* 0/1.

Cornaceae 0/5, 0/9 (19), *Alangium* (*Alangiaceae*) 0/1, *Cornus* 2/4, *Garrya*, (*Garryaceae*) 0/3, *Griselinia* (9) 0/3, *Nyssa*, (*Nyssaceae*) 0/2.

Caprifoliaceae (incl. *Adoxaceae*) 0/3, 0/11 (19).

Rubiaceae 0/20 (19).

Tribe I—*Naucleeae* : genera 1 to 8, 0/17.

Tribe II—*Cinchoneae* : *Cinchona* 1/4, *Remijia* 1/5, genera 12 to 17, 0/8, *Coptosapelta* 6/6, genera 19 to 20a, 0/6, *Danais* 17/18, genera 22, 23, 0/3, *Manettia* 1/4, genera 25 to 42a, 0/26, *Mussaendopsis* 1/2, *Thysanospermum* 1/1, genera 44 and 44a, 0/2.

Tribe III—*Henriquezieae* : genera 45 and 46, 0/3.

Tribe IV—*Condamineae* : genera 47 to 55, 0/14.

Tribe V—*Rondeletieae* : genera 56 to 58a, 0/6, *Acrobotrys* 1/1, genera 59 to 70, 0/21.

Tribe VI—*Hedyotideae* : genera 72 to 77, 0/12, *Sacosperma* 2/2, genus 78 0/1, *Otomeria* 3/8, genera 79a and 80, 0/2, *Hedyotis* 10/10, *Phyllocrater* 1/1, genus 82, 0/1, *Oldenlandia* 3/7, 1/1, (19), genera 84 to 88, 0/5, *Synaptanthera* 1/1, genera 89a to 97, 0/8.

Tribe VII—*Mussaendeae*: genera 98 to 102, 0/10, *Olostyla* 1/1, genera 104 to 106, 0/3, *Lucinaea* 3/5, genus 108, 0/1, *Polysolenia* 1/1, genera 110a and 110b, 0/2, *Adenosacme* 1/1, *Myrioneuron* 2/3, genus 113a, 0/1, *Pauridiantha* 3/3, *Pamplethantha* 2/2, *Commitheca* 1/1, *Poecilocalyx* 1/1, genera 115 to 117a, 0/3, *Aulacodiscus* 4/4, *Urophyllum* 41/41, *Williamsia* 2/2, genera 121 and 122, 0/7, *Temnopteryx* 1/1, *Patima* 1/1, *Coccocypselum* 15/15, genera 127 to 132, 0/9, *Praravinia* 21/21, genus 133a, 0/1.

Tribe VIII—*Hamelieae* : genera 134 to 139, 0/10.

Tribe IX—*Catesbaeeae* : genera 140 to 144, 0/5.

Tribe X—*Gardenieae* : genera 145 to 180a, 0/68, *Scyphostachys* 1/1, genera 182 to 189 0/9.

Tribe XI—*Cruckshanksieae* : genus 190, 0/1.

Tribe XII—*Retiniphylleae* : genera 192 to 195a, 0/6.

Tribe XIII—*Guettardeae* : genera 196 to 206, 0/12.

Tribe XIV—*Knoxieae*: genus 207, 0/1, *Neobaumannia* 1/1, *Pentanisia* 6/8.

Tribe XV—*Chiococceae* : genera 209 to 214a, 0/9, *Asemnantha* 1/1, genera 216 to 218, 0/6.

Tribe XVI—*Alberteae* : genera 220 to 223, 0/5, *Lamprothamnus* 1/1, genus 224a, 0/1, *Alberta* 2/2, genera 225a to 226f, 0/9, *Pachystigma* 1/4, genus 226h, 0/3.

Tribe XVII—*Vanguerieae* : *Canthium* 14/25, genera 227a to 228a, 0/11, *Calanda* 1/1, *Perakanthus* 1/2, genera 229 to 232, 0/10, *Craterispermum* 9/9, genus 234a, 0/1.

Tribe XVIII—*Ixoreae* : genus 235 0/3, *Pavetta* 3/33, genera 236a to 245, 0/16.

Tribe XIX—*Morindeae* : *Morinda* 6/16, *Rennellia* 2/2, *Tribrachya* 1/1, *Damnacanthus* 1/1, 1/1 [19], *Prismatomeris* 9/9, *Zeuxanthe* 1/1, genera 252 to 253, 0/4, *Bellynkxia* 2/2, *Appunia* 2/3, *Appunettia* 1/1, genus 255, 0/1.

Tribe XX—*Coussareeae* : *Coussarea* 8/8, *Faramea* 41/41.

Tribe XXI—*Psychotrieae* : *Calycosia* 3/3, *Calycodendron* 6/6, genus 259c 0/1, *Straussia* 3/3, genus 261, 0/1, *Cleisocratera* 1/1, *Psychotria* (new world), 91/108, *Psychotria* (old world, incl. 11 *Mapouria*) 77/205, *Grumilea* 3/7, genus 263b, 0/1, *Coelopyrena* 1/1, genera 263d and 263e, 0/3, *Palicourea* 35/36, *Rudgea* 20/20, *Chasalia* 6/9, genus 267, 0/1, *Declieuxia* 10/11, *Congdonia* 1/1, *Geophila* 1/6, *Cephaelis* 38/48, *Trichostachys* 1/1, *Lasianthus* 35/35, 1/1 [19], *Allaeophania* 1/1, *Saldinia* 1/1, *Amaracarpus* 6/9, *Dolianthus* 1/1, *Suteria* 2/2, genus 277, 0/1, *Saprosma* 8/8, *Litosanthes* 1/1, *Hydnophytum* 3/15, genera 280a and 281, 0/4, *Psathura* 3/3, genus 283, 0/2, *Fergusonia* 1/1, *Margaritopsis* 1/1.

Tribe XXII—*Paederieae* : genera 286 to 291a 0/9.

Tribe XXIII—*Anthospermeae* : genera 292 to 294 0/3, *Mitchella* 1/1 [12, 19], genera 297 to 300 0/5, *Coprosma* 1/3, genera 302 to 309 0/8.

Tribe XXIV—*Spermacoceae* : genera 311 to 317 0/8, *Borreria* 9/14, genera 320 and 321 0/2, *Emmeorhiza* 1/1, genus 323 0/1, *Richardsonia* 2/7, genus 325 0/1, *Staelia* 1/1.

Tribe XXV—*Galieae* : genera 327 and 328 0/2, *Rubia* 1/4, *Relbunium* 2/7, genera 331 to 337a 0/7.

Unplaced genera: 0/14, *Amphidasya* 1/1, *Hedstromia* 1/1, *Stachyococcus* 1/1.

Valerianaceae 0/1 [19], *Dipsacaceae* 0/1 [19], *Calyceraceae* 0/2, *Compositae* 0/2, 0/49 [19], *Stylidiaceae* 0/1, *Goodeniaceae* 0/5, *Campanulaceae* (incl. *Lobeliaceae*) 0/4, 0/5 [19], *Vacciniaceae* 0/11, *Ericaceae* (incl. *Clethraceae*, *Pyrolaceae*) 0/29, 0/28 [19], *Monotropaceae* 0/1, *Epacridaceae* 0/3.

Diapensiaceae, *Pyxidanthera* 1/1 [3, 12], *Diapensia* 2/2, 1/1 [19], *Shortia* 1/1, 2/2 [19], *Schizocodon* 2/2, *Galax* 1/1 [3, 12], *Berneuxia* 1/1 [3].

Lennoaceae 0/2, *Plumbaginaceae* 0/2, *Primulaceae* 0/6 [19].

Myrsinaceae (incl. *Theophrastaceae*) 0/15, 0/4 [19], *Rapanea* 2/5, 1/1 [8], *Suttonia* 1/1, *Sapotaceae* 0/2 [19], *Hoplestigmataceae* 0/2, *Ebenaceae* 0/2, 0/1 [19], *Styracaceae* (incl. *Lissocarpaceae*) 0/7, 0/1 [19], *Symplocos* 13/13, 1/1 [14], 6/6 [19], 1/1 [12], 1/1 [8], *Cordyloblaste* 6/10 (*Symplocaceae*), *Oleaceae* 0/2, 0/10 [19], *Salvadoraceae* 0/6, *Apocynaceae* 0/2 [19], *Asclepiadaceae* 0/1 [19], *Loganiaceae* (incl. *Desfontainiaceae*) 0/9, 0/1 [19], *Antonia* 1/1, *Strychnos* 21/32, *Gaertnera* 39/42 (*Rubiaceae*).

Gentianaceae 0/5, 0/7 [19], *Calolisianthus* [17] 1/2, *Tachia* [17] 3/3.

Polemoniaceae 0/3, *Hydrophyllaceae* 0/1, *Boraginaceae* (incl. *Tetrachondraceae*) 0/3, *Cardiopteridaceae* 0/2, *Convolvulaceae* (incl. *Nolanaceae*) 0/2, 0/1 [19], *Solanaceae* 0/4, *Scrophulariaceae* 0/2, 0/11 [19], *Orobanchaceae* 0/1 [19].

Lentibulariaceae 0/2, 0/1 [19], *Utricularia* 2/3, 1/1 [19].

Columelliaceae 0/3, *Gesneriaceae* 0/3, *Bignoniaceae* 0/1, 0/1 [19], *Pedaliaceae* (incl. *Martyniaceae*) 0/3, *Acanthaceae* 0/3, *Myoporaceae* 0/3, *Selaginaceae* (incl. *Globulariaceae*) 0/3, *Verbenaceae* 0/4, *Labiatae* 0/4, *Plantaginaceae* 0/2, 0/2 [19], *Nyctaginaceae* 0/1, *Illecebraceae* 0/1, *Amaranthaceae* 0/2 [19] *Cheno-*

podiaceae (incl. *Basellaceae*) 0/1, 0/2 [19], *Phytolaccaceae* (incl. *Gyrostemonaceae*, *Petiveriaceae*) 0/4, 0/1 [19], *Sphenocleaceae* 0/1, *Batidaceae* 0/1, *Polygonaceae* 0/13 [19], *Podostemaceae* (incl. *Hydrostachyaceae*) 0/3, *Nepenthaceae* 0/2, *Cytinaceae* (incl. *Hydnoraceae*, *Rafflesiaceae*) 0/3, *Aristolochiaceae* (incl. *Saururaceae*) 0/3, *Piperaceae* 0/8, *Chloranthaceae* 0/2, *Myristicaceae* 0/2.

Monimiaceae

Tribe I—*Hortonieae* : *Hortonia* 1/1, *Peumus* 1/1, *Amborella* 1/1, *Hedycarya* 4/8, *Levieria* 0/3.

Tribe II—*Trimenieae* : *Trimenia* 1/2, *Piptocalyx* 0/1, *Xymalos* 0/2.

Tribe III—*Mollinedieae* : *Macropeplus* 1/1, *Mollinedia* 11/16, *Ephippiandra* 0/1, *Matthaea* 2/4, *Steganthera* 0/1, *Anthobembix* 1/3, *Tetrasynandra* 2/3, *Wilkiea* 4/4, *Kibara* 11/11, 1/1 [12].

Tribe IV—*Monimieae* : *Palmeria* 0/2, *Monimia* 0/2, *Scyphostegia* (*Scyphostegiaceae*) 0/1, *Tambourissa* 4/10, *Hennecartia* 0/1.

Tribe V—*Laurelieae* : *Daphnandra* 0/2, *Laurelia* 0/1, *Antherosperma* 0/1, *Doryphora* 0/1.

Tribe VI—*Siparuneae* : *Siparuna* 2/9, *Glossocalyx* 2/2, *Bracteanthus* 0/1.

Lauraceae (incl. *Gomortegaceae*) 0/23, 0/6 [19], *Endlicheria* 1/1, *Aiouea* 6/6, *Ocotea* 2/8, *Litsea* 20/44, *Lindera* 6/15.

Hernandiaceae 0/1.

Proteaceae 0/5, 0/1 [19], *Hollandia* 1/1, *Brabejum* 1/1, *Panopsis* 6/7, *Euplassa* 3/3, *Hicksbeachia* 1/1, *Cyanocarpus* 1/2, *Guevina* 1/1, *Kermadecia* 2/2, *Macadamia* 2/6, *Roupala* 1/7, *Lambertia* 0/5, *Xylomelum* 2/4, *Helicia* 32/33, *Orites* 5/7, 1/1 [18], *Grevillea* 0/3, *Hakea* 0/1, *Carnarvonia* 0/1, *Buckinghamia* 0/1, *Musgravea* 1/1, *Darlingia* 1/1.

Thymelaeaceae (incl. *Gonystylaceae*) 0/7, 0/4 [19], *Penaeaceae* 0/2, *Geissolomataceae* : *Geissoloma* 1/1.

Elaeagnaceae 0/2 [19], *Loranthaceae* 0/3, *Santalaceae* (incl. *Grubbiaceae*, *Myzodendraceae*) 0/4, *Balanophoraceae* (incl. *Cynomoriaceae*) 0/2.

Euphorbiaceae (incl. *Buxaceae*) [9], 0/10, 0/15 [19], *Uapaca* 1/7, *Aporosa* 24/24, 1/1 [12], *Daphniphyllum* (*Daphniphyllaceae*) 5/9, *Baccaurea* 23/23, 1/1 [12], *Cometia* 0/1, *Antidesma* 2/7, 0/1 [12].

Balanopsidaceae 0/3, *Urticaceae* (incl. *Ulmaceae*, *Moraceae*, *Cynocrambaceae*, *Cannabinaceae*) 0/6, 0/17 [19], *Platanaceae* 0/1, *Leitneriaceae* 0/1, *Juglandaceae* 0/15, 0/1 [19], *Carya* 7/25, 2/2 [15, 16], *Engelhardtia* 1/15.

Rhoipteleaceae 0/1, *Myricaceae* 0/3, 0/1 [19], *Casuarinaceae* 0/1, *Julianiaceae* 0/1, *Cupuliferae* (incl. *Betulaceae*, *Corylaceae*, *Fagaceae*) 0/6, 0/16 [19], *Salicaceae* 0/3, *Lacistemaceae* 0/2, *Empetraceae* 0/1 [19] *Ceratophyllaceae* 0/1 [19].

Total number of aluminium plants: 1779 +24 [19] +11 [12] +7 [9, 14, 15, 16, 18]=1821.

Total number of species tested: 2859+462 [19]+17 [12]+7 [9, 14, 15, 14, 18]=4345.

Discussion

It is clearly apparent from the above lists that the ability of dicotyledons to accumulate aluminium in large amounts is restricted to certain well-defined families or groups of genera. There are 31* families in which aluminium-accumulators have been found, but only in the *Vochysiaceae*, *Pentaphylacaceae*, *Octoknemaceae*, *Phyllonomaceae*, *Diapensiaceae* and *Geissolomataceae* is aluminium accumulation a constant feature for every species. With regard to genera : out of 302 accumulating genera, 206 may be considered as wholly accumulating, since 95 per cent. or more of their species are aluminium-plants. The largest number of accumulating species was found in the *Rubiaceae* (647 from 91 genera), but the *Melastomataceae* (441 from 105 genera) probably has just as many judging from the number of untested species with leaves which dry yellowish-green.

Aluminium-plant families and genera are not usually closely related in any of the well-known taxonomic systems, but there are resemblances and ties of affinity between them. There are five characters which are very frequent if not universal amongst aluminium-plants, viz. —

1. The arborescent habit ; there are probably not more than three genera of soft stemmed herbs, e.g., *Coccocypselum* spp.

2. Leathery leaves with a fine but prominent reticulate venation.

3. Conspicuous inflorescences, e.g., *Palicourea* spp., *Psychotria* spp., *Hydrangea* spp.

4 Aluminium is essential to the growth of aluminium-plants ([7, 12]), and since available (cationic) aluminium is only found in acid soils, these plants only grow in such soils. (A detailed ecological study will be published elsewhere).

5. The cell-sap acidity range of aluminium-plants is quite narrow and comparatively low ; pH 3·6–pH 5·2. If this were not so the aluminium would have been precipitated as phosphate in root and stem tissues long before the leaves were reached.

The best instances of affinity between diverse aluminium-accumulating families are displayed by the *Symplocaceae* : (1) with the *Theaceae* through the genus *Symplococarpon* ([1]) and (2) with the *Polygalaceae* through the genera *Barnhartia* and *Diclidanthera*. In connection with the last mentioned genus it is interesting to note that in J. Hutchinson's key ([13]) to dicotyledons it keys out next to the *Diapensiaceae*. The genus *Strychnos* (*Loganiaceae*) affords another example of this kind of affinity : through the genus *Gaertnera* with the *Rubiaceae* and directly with the *Melastomataceae* ([13]).

Morphological similarities are evident beween at least one species of each of the genera *Eurya*, *Laplacea*, *Tutcheria* (*Theaceae*) ; *Psychotria* (*Rubiaceae*); *Aporosa*, *Baccaurea* (*Euphorbiaceae*); and *Kibara* (*Monimiaceae*), since all have species whose " Symplocos-like " characters are perpetuated in the specific name.

*Figures cited under this heading include all the findings of other workers (8, 9, 10, 13, 15, 16, 18, 19)

Referring back to the lists, another outstanding point is the comparatively large number of small and/or anomalous families that are aluminium-accumulating. The individuality of most of these families and the various groups of genera is unquestionable. It would thus be not unreasonable to anticipate the elevation of the latter (either singly or together) to family rank, e.g., *Polyosma* (*Escalloniaceae*), the "*Grevilleeae*" excluding *Grevillea* (*Proteaceae*) ; *Baccaurea* and *Aporosa* (*Euphorbiaceae*). In this connection Airy-Shaw ([1]) has already advocated, on morphological grounds, the separation of the weakly aluminium-accumulating genera *Ternstroemia* and *Anneslea* from the rest of the *Theaceae* which is wholly accumulating if the tribe *Bonnetieae* is excluded.

It would appear from the above that the uptake of aluminium has some value in plant taxonomy. Both Hutchinson ([10]) and Hallier ([9]) believed that it exhibits a high degree of specificity. This has been borne out in the present survey but it will not be considered further until the very large genera *Miconia* and *Psychotria*, etc., have been more thoroughly investigated. A survey of the rest of the plant world is also contemplated.

Acknowledgements

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AMPHICOME—A SUPERFLUOUS GENUS OF BIGNONIACEAE.

D. Chatterjee.

The name *Amphicome* was proposed by Royle[1] as a sub-genus of *Incarvillea* A. Juss. Royle accepted the opinion of R. Brown and wrote " the Himalyan species are too closely allied to be separated into a genus distinct from the Chinese *Incarvillea*, but are yet sufficiently distinguished to constitute a sub-genus." When G. Don[2] raised the sub-genus to generic rank he seemed to have had some doubts as to its relationship as the genus was given a place far away from *Incarvillea*, i.e. between *Gesneriaceae* and *Labiatae*. Lindley[3] in his discussion said " Dr. Brown considers this genus (i.e. *Amphicome*) not distinct from *Incarvillea* and in conformity with that opinion Dr. Royle has abandoned his name *Amphicome*. Nevertheless it appears to me that the characters assigned to the latter as a sub-genus are quite sufficient for a higher purpose, in an order the distinctive characters of which are those of dicarpus monopetalae." Lindley only stated the above, but did not actually give a definite generic description in the usual way, although the genus *Amphicome* is ascribed to him by DeCandolle[4], Clarke[5], and even recently by Handel-Mazzetti[6]. But it should be noted that G. Don raised the name to generic rank and gave a generic description earlier than Lindley.

During the last fifty years a number of new species of *Incarvillea* have been described from Northern Asia, China and Tibet, and it is now possible to assess whether G. Don was right in raising the sub-genus *Amphicome* of Royle to the status of a genus. An examination of most of the species of *Incarvillea* with only two species of *Amphicome* clearly shows that this treatment into two separate genera is not only articificial and arbitrary

but also superfluous. All these species together form a very natural assemblage and could be accommodated within *Incarvillea* with very slight modification in the description of the character of the seed. The points of distinction given by DeCandolle (l.c.) do not hold good, and Bentham and Hooker f.[7] clearly stated at the end of their description of *Amphicome*,—

" *Genus Incarvilleae valde affinis, imprimis seminibus distinctum.*"

The writer has attempted to verify whether the other characters emphasised by Royle, G. Don and DeCandolle are really significant for generic distinction, but this has only convinced him that these, too, do not work. For example, it has been suggested that the leaf is bipinnate in *Incarvillea* and only pinnate-compound in *Amphicome*. An examination of *Incarvillea lutea* Bur. et Franch., *I. grandiflora* Bur. et Franch., and *I. younghusbandii* Sprague shows that all these plants have simple as well as pinnate leaves but none have bipinnate leaves. The 10-cleft structure of the calyx also could not be used for generic distinction as suggested by some authors, as most of the species of *Incarvillea* have a 5-cleft calyx, like *Amphicome*.

Lastly, we come to the seed character, where we find that the seed is winged in *Incarvillea* and hairy in *Amphicome*. Royle and Bentham and Hooker f. have stressed the point that the margin of the seed is undivided in *Incarvillea* to distinguish it from the much divided hairy structure found in *Amphicome*. The undivided margin is not a constant character in *Incarvillea*, as we find in *I. olgae* Regel. the margin is irregularly lacerated here and there. In *I. younghusbandii* Sprague the seed-membrane is regularly cut and divided and has a distinctly wavy appearance. It has been described as *lacerato-alata*. In *Amphicome*, although the margin is finely lacerated into two distinct comae, a trace of the membranous structure is still noticeable at the two ends of each seed. Thus, the formation of the comae might be regarded as an extreme case of the process of laceration which can be partially observed in *I. younghusbandii* Sprague.

The characters of *Incarvillea* as given by A. Jussieu (Gen. Pl. 138 : 1789) are as follows :—

Calyx 5-fidus, 3-bracteatus, corolla basi tubulosa, fauce ventricosa, limbo 5-loba, inequalis. Stamina 4, didynama, antheris 2-lobis. Stigma 2-lamellatum, capsula siliquaeformis, compressa, longa, angusta, acuta, 2-locularis, 2-valvis, dissepimento valvis opposito ; polysperma, seminibus alatis. Herba sinensis ramis alternis, striatis, folia alterna pinnato-laciniata ; flores laxissime spicate terminales, corolla digitalis ; fructus fere catalpae aut faenu-graeci, stamen quintum sterile. non vidi.

It will be evident from the above description that with the modification of the character of the seed as suggested by R. Br. ex Royle (*membranaceo-marginata, vel lacerato-alata, vel comosa*), all the species of *Incarvillea* and *Amphicome* could be included in one natural genus.

Some of the characters commonly found in both these groups but not emphasized in previous works are (i) the peculiar woody caudex of the perennating stem, (ii) 3-fid bracts, (iii) grouping of all anthers into two common points in each flower, (iv) included stamens and (v) stigmas

with two broadly ovate lobes. *Amphicome emodi* Lindley, in its general features approaches *Incarvillea lutea* Bur. et Franch. and *I. delavayi* Bur. et Franch, while *Amphicome arguta* (Royle) G. Don can be easily compared with *Incarvillea olgae* Regel.

The writer is convinced from the reasons given above that *Amphicome* cannot be maintained as a distinct genus apart from *Incarvillea* and as a genus the name *Amphicome* has to be abandoned. At most, it should be replaced in its former position as a section of *Incarvillea*. The names and synonymy should be as follows :—

Incarvillea *A. Juss* emend. *R. Br. ex Royle*, Illustr. Himal. Pl. 295 (May, 1836).

Incarvillea A. Juss., Gen. Pl. 138 (1789).

Amphicome (R. Br. ex Royle) G. Don, Gen. Syst. **4,** 655 (1837).

Amphicome Lindley Bot. Reg. **24,** tab. 19. in note (1838).

Amphicome R. Br. ex Royle, as sub-genus of *Incarvillea* in Royle Illustr-Himal. Pl. 296 (May, 1836).

1. **Incarvillea diffusa** *Royle* l.c. tab. 72, i (December, 1835). The plate of this plant was published and distributed earlier than the text. The above name given to the plate thus antedates the other name used in the text. For dates of publication of different parts and plates of Royle's Illustr. Himal. Pl. see Stearn's paper in Journ. Arn. Arb. **24,** 484 (1943).

Incarvillea arguta Royle l.c. 296 (May, 1836).

Amphicome arguta (Royle) G. Don, Gen. Syst. **4,** 665 (1837).

Amphicome arguta (Royle) Lindley in Bot. Reg. **24,** tab. 19 (April, 1838) ; D.C. Prodr. **9,** 237 (1845) ; Stewart, Punjab Pl. 148 (1869) ; C. B. Clarke in Fl. Br. Ind. **4,** 385 (1884) ; Collett, Fl. Simlensis, 369 (1902) ; Strachey, Pl. Kumaon 132 (1906) ; Bamber, Pl. Punjab 403 (1916) ; Hand-Mazz., Symb. Sinicae **7,** 889 (1936).

Amphicome diffusa (Royle) Sprague in Kew Bull. 1933, 386.

2. **Incarvillea emodi** (*Lindley*) *Chatterjee* comb. nov.

Incarvillea emodi Wall. in Wall. Cat. 487, second example, *nomen* ; Royle l.c. 295 et 296 in note, *nomen.*

Amphicome emodi Lindley in Bot. Reg. **24,** tab. 19 in note (1838) ; D.C. Prodr. **9,** 237 (1845) ; Hook. in Bot. Mag. 4890 (1855) ; C. B. Clarke in Fl. Br. Ind. **4,** 385 (1884) ; Collett, Fl. Simlensis 369 (1902) ; Bamber, Pl. Punjab 403 (1916).

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2. Gen. Syst. **4,** 665 (1837).
3. Bot. Reg. **24,** tab. 19 (1838).
4. Prodr. **9,** 237 (1845).
5. Fl. Br. Ind. **4,** 385 (1884).
6. Symb. Sinicae **7,** 889 (1936).
7. Gen. Pl. **2,** 1049 (1876).

Some Misplaced Cyanophyceae. During an investigation into the fungus genus *Sporoschisma* Mr. S. J. Hughes came across three plants which he rightly judged to be blue-green algae and which he passed on to Kew Herbarium for identification.

One of these forming blackish patches on Juniper came from Umea in Sweden, and the specimen examined was the type from which is 1908 Lind and Vleugel described a new species of *Sporoschisma*, *S. juniperi*. It clearly belongs to the *Scytonemataceae* and to the genus *Scytonema*. It must have been placed amongst the fungi on a somewhat cursory examination. Admittedly there is some resemblance, as for instance between the dark coloured sheath and the dark hyphae of the fungus, and also between the masses of hormogonia and the spores of the fungus. Cyanophyceae characters are the faintly blue-green trichomes, the heterocysts, and the biconcave cells which split off the hormogonia. The heterocysts it is true can be easily overlooked but they stand out clearly after staining with chlorozinciodide though not with cotton blue as is usual in mycological technique. This species occurs as dark green tufts standing about 1 mm. high. The filaments are 7–9μ wide, sparingly branched and most of the branches are geminate. The trichomes are 6–7μ wide, the sheath is yellowish-brown, growth is terminal and hormogonia are produced in abundance. These characters seem to place it without much doubt amongst the forms of the cosmopolitan *Scytonema Hofmanni*, a species originally described by the elder Agardh on material also from Sweden but from farther south in the province of Gothland.

The second of these plants sent for identification was labelled *Sporoschisma mirabile* Berk. & Br. Attached to a sheet from the Roussel Herbarium in Paris were four specimens with the following particulars "Meloduni : ad Ulmos et corticis Mali : 1849–1854." The locality is S.S.E. of Paris in Seine et Marne. The fragment seen was taken from the specimen at the top right hand of the sheet. It is dark coloured like the previous species but has a different type of growth forming a stratum of interwoven filaments on the bark of *Malus*. These filaments have the features of a *Tolypothrix* on the old definition, although it is now considered that the line of demarcation between *Scytonema* and *Tolypothrix* which is in general use is a false one. The filaments are 10–12μ, the trichomes 9–10μ and the branches arise singly from the base of a heterocyst, so that this specimen fits into another cosmopolitan species *Tolypothrix byssoidea*. It has not been possible to see whether the heterocysts at the base of the branches have one or two pores but as *T. byssoidea* is one of the species which Bharadwaja* retains in *Tolypothrix* presumably it has one pored heterocysts.

The third of these rejected specimens was under the name of *Sporoschisma Tracyi* Earle and was a microscopic preparation made from part of the type collection from Florida. There is no doubt that it is a blue-green alga but the only preparation available was a small one in cotton blue and lacto-phenol and it was inadequate for determination.

C. I. Dickinson.

* Y. Bharadwaja. Rev. Alg. VII, p. 149, 1934.

AMPELOCISSUS KIRKIANA : A NEW GENERIC RECORD FOR THE TRANSVAAL.

A. A. Bullock.

My colleague, Mr. R. D. Meikle, has drawn my attention to two sheets of an Ampelidaceous plant collected by Mr. H. Lang in the Transvaal which appear to represent a species hitherto recorded only from southern tropical Africa. Since the species is not very well known, and the genus has not been recorded from South Africa, I have thought it worth while to give some account of the history and known distribution of the plant in order to draw collectors' attention to it.

Ampelocissus kirkiana was described by Planchon (1887) in his monograph of the family, from a drawing (No. 145) made by Sir John Kirk and preserved in the Kew herbarium. The drawing was made in 1859 from a plant found near the river Luabo, but apparently no specimen was preserved. The next re-arrangement of the African species of the family was by Gilg and Brandt (1912), who relegated *A. kirkiana* to *species non satis nota* on the grounds that no specimen existed and that Planchon's description from Kirk's drawing left much to be desired. In the meantime Gilg (1895) had described *Ampelocissus pulchra* from a specimen collected by Stuhlmann (No. 6485) in the Usaramo district of Tanganyika and Gilg and Brandt (1912) identified with it specimens collected in the Lindi district of Tanganyika by Koerner (No. 2244) and near Mukotora in the Zambezi basin by Menyhart (No. 721).

None of the collections cited by Gilg and Brandt is represented in the Kew herbarium, but there is a specimen extracted from a collection made by Kirk in the coastal area opposite to Zanzibar which agrees very exactly with the description of *A. pulchra*. I am convinced that this specimen in fact represents *A. pulchra*, and there is little doubt that it is also *A. kirkiana*. Planchon's description, based on Sir John Kirk's rough sketch and field notes, takes no account of such features as indumentum and form of leaflet-serration. On the other hand, it contains nothing by which *A. pulchra* as described by Gilg, can be excluded, whilst the geographical data point to conspecificity.

Since the original specimens cited under *A. pulchra* by Gilg and Brandt were probably destroyed at Berlin during the Second World War, the specimens which I now refer to *A. kirkiana* are listed below. These include the two collections referred to above which constitute a new generic record for South Africa.

Mr. Lang's specimens are recorded by Miss A. A. Obermeijer (1937) as *Rhoicissus erythrodes* (Fres.) Planch. in her account of the plants of the Kruger National Park ; my record of this as a misidentification is based on the specimens at Kew, received from the herbarium of the Transvaal Museum.

Ampelocissus kirkiana *Planch.* in DC. Monogr. Phan. **5** : 403 (1887) ; Gilg in Engl. Pflanzenw. Ost-Afr. C. : 257 (1895) ; Gilg et Brandt in Engl. Bot. Jahrb. **46** : 435 (1912) sub "species non satis notae."

A. pulchra Gilg *l.c.* ; Gilg et Brandt *l.c.* 434, f.1F.

Rhoicissus erythrodes (Fres.) Planch. sec. Oberm. in Ann. Transvaal Mus. **17** : 212 (1937), non *Vitis erythrodes* Fres. nec *Rhoicissus erythrodes* Planch.

Tanganyika Territory. "Forest opposite Zanzibar", in a package received [at Kew] from Sir John Kirk, March, 1878. (Identified *ex descriptione et icone* by Dr. T. A. Sprague).

Portuguese East Africa. Sofala, at sea level, a climber, *Johnson* 24. Massinga, dans les places d'anciennes cultures ; sol aréneux ; Dec. 1936, *Gomes e Sousa* 1937. Luabo River, Dec. 1859, *Sir John Kirk* ic. ined. No. 145 (typ. spec.) Namagoa Estate, Lugela-Mocuba, 1946, *Mrs. H. Faulkner*, Pretoria no. 40.

Transvaal. Baiandbai, Zoutpansberg, Nov. 1932, *Lang* 32305. Mabase, Zoutpansberg, Nov. 1932, *Lang* 32161.

Probably also in Southern Rhodesia.

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ON A SPECIES OF DANAIS COMMERS. EX VENT. OCCURRING ON THE AFRICAN CONTINENT.

C. E. B. Bremekamp.

An East African *Rubiacea*, of which specimens had already been distributed by the Berlin Herbarium under the manuscript name *Oldenlandia chrysorrhoea* K.Sch., was described by *K. Schumann* in Engl. Bot. Jahrb. **28,** 58, 1899 as *Urophyllum xanthorrhoeum.* In a paper published in the same journal (**71,** 202, 1940) I have pointed out that no true representatives of the genus *Urophyllum* Wall. are found in Africa, and that most of the African species that had been referred to this genus, belong in reality to *Pauridiantha* Hook.f. and to some of the latter's nearest allies. With regard to *U. xanthorrhoeum*, however, I did not come to a definite conclusion. As the ovary proved to be bilocular, and as each of the cells contained but a single placenta, it certainly could not belong to *Urophyllum*, but as the ovary cells were not divided in the upper part by false septa, and as the style ended in two filiform stigmas, it could not belong to *Pauridiantha* and the latter's nearest allies either. I suggested that it might belong to *Pentas* Benth., but I was well aware of the fact that it showed but little resemblance to the typical representatives of that genus. Its calyx lobes, for instance, differed but slightly in size, and none of them was ever developed into the large and showy appendages that give the inflorescences of the species belonging to this genus their peculiar character. The stipules too were of a different kind, for they were not divided into narrow segments crowned by colleters, and a reinvestigation has shown that the short processes which I interpreted, l.c., as homologues of these appendages, are no excrescences of the margin but merely large colleters inserted on the inside of the stipules.

By the courtesy of the Director of the Royal Botanic Gardens, Kew, I have now been able to investigate several excellent specimens of this plant, among which a fruiting one collected by Mr. Koritschoner proved to be of special importance. The presence of a marginal wing round the seeds showed that the plant could not belong to *Pentas* ; on account of this character and because of the insertion of the seeds parallel to the surface of the placenta it appears now that it will have to be referred to one of the genera of the *Cinchoneae*. The true representatives of this tribe are a group of American genera provided with elongated placentas that are attached to the septum from top to bottom ; another peculiarity of them is the complete absence of raphides. A few genera have been included in this group because they are, like the typical representatives, provided with winged seeds and because their corolla lobes show, like those of the latter, a valvate aestivation ; their placentas, however, are not elongated but peltate and attached by means of a short stipe to the lower half of the septum, and raphides are always present. Among the latter we will have to look for the genus to which *Schumann's Urophyllum xanthorrhoeum* will have to be referred. As the genus *Danais* Commers. ex Vent. is the only one among them in which we find the panicles of comparatively small flowers and the small globose capsules that characterize the East African plant, this seems to be the right place for it.

At first I was somewhat reluctant to refer the plant meant by *Schumann* to this genus because the principal handbooks consulted by me (*Bentham & Hooker*, *Engler & Prantl*, *Lemée*) state that the species belonging to this genus are either dioecious or polygamo-dioecious, whereas the flowers of the East African plant proved to be bisexual, but a study of the literature soon led to the conclusion that the handbooks are wrong. The error they help to perpetuate has, in fact, already been exposed by *Cordemoy* in Adansonia **10,** 356, 1873. Its origin is to be found in *Lamarck's* description of *Paederia fragrans* (Dict. **2,** 260), the species on which afterwards the genus *Danais* was based. *Cordemoy* tells the story in the following words :

" Les fleurs, dit Lamarck, sont dioïque-fausses ou par avortement, c'est à dire que sur certains pieds ce sont les étamines qui prennent de l'accroissement et font avorter les pistils, tandis que le contraire arrive sur d'autres pieds. Or, comme il semble que ce soit un sexe qui détruit l'autre, Commerson en a pris occasion pour donner à cette plante un nom qui rappelle le trait historique de la fable des Danaïdes."

" Les fleurs mâles, dit plus loin Lamarck, ont un pistil infécond . . . . On n'aperçoit dans les femelles que des rudiments d'étamines."

" Or, ce sont là des erreurs reproduites dans tous les livres et que consacre le nom choisi mal à propos par Commerson."

Cordemoy assures us that the pistil of *Danais fragrans* is always fertile and that the stamens are never rudimentary, but that this plant exhibits a dimorphism of the same kind as that of the " Primevère, rendu célèbre par les observations de M. Darwin", in other words that it is heterostylous. Mlle. *A.-M. Homolle* remarks with regard to this question in a paper in Notulae Systematicae **5,** 288, 1936, in which she describes several new *Danais* species " Ce dimorphisme est fréquent dans le genre *Danais*." *Cordemoy* further pointed out that the two forms differ not only

in the position of the anthers and stigmas but also in the degree of hairyness of the corolla throat. This difference is present in the East African plant too.

From what I have said on the generic descriptions given in the principal handbooks, it will be clear that *Cordemoy's* voice has been a " vox clamantis in deserto", for the error pointed out by him in 1873 has never been completely eradicated. However, since *Lamarck* published his description of *Paederia fragrans*, a fairly large number of *Danais* species have been made known, but not a single description mentions the presence of unisexual flowers, and of all the better known species it is fairly certain that they are heterostylous. Another kind of floral mechanism has, at any rate, now here been mentioned.

The genus *Danais* was up to now known from the Mascarenes, Madagascar and the Comoros, and its presence in the adjoining part of the African continent is therefore a noteworthy fact. As the East-African plant, doubtless on account of the yellow dye contained in its roots, is regarded as medicinal, and as the *Danais* species of Madagascar and the Mascarenes too are known as drugs, I was at first inclined to regard it as an introduced species, the more so as it is found in a rather densely populated part of the country, in which there is a good deal of traffic. Comparison with the descriptions of some of the Madagascar species, moreover, failed to reveal differences of any importance. A re-investigation of these species, which was also made possible to me by the aid of the Director of the Royal Botanic Gardens, showed that the East-African plant must nevertheless be regarded as specifically distinct. The species to which it shows the strongest resemblance, are *D. rhamnifolia* Baker, *D. ligustrifolia* Baker and *D. humblotii* Homolle, but from the first it proves to differ in its narrower leaves and entirely glabrous shoots, from the second in its thinner leaves and longer corolla lobes, and from the third in the larger number of lateral veins and in the smaller size of the flowers. From *D. comorensis* Drake, which it resembles in the glaucous underside of the leaves, it differs in the narrower shape of the latter and in the presence of lateral and terminal inflorescences ; the inflorescences of *D. comorensis* are all lateral.

Like most of the *Danais* species the East-African plant is a liana. Its stem seems to reach a length of 30 m., and at the right season the whole plant is said to be covered with a profusion of orange-red flowers. In the bud the latter are light yellow or nearly white, but they appear in such abundance that even then their colour dominates over the green of the other parts.

The name of the plant becomes therefore **Danais xanthorrhoea** (*K. Sch.*) *Brem.* n. comb. Synonyms are *Urophyllum xanthorrhoeum* K. Sch. in Engl. Bot. Jahrb. **28,** 58, 1899, and *Pentas ? xanthorrhoea* (K. Sch.) Brem. op. cit. **71,** 202, 1940.

The plant is apparently confined to a comparatively small part of Tanganyika. Up to now it has been collected in the following localities : Usambara, Malo (Buchwald 438, type) ; Derema (Scheffler 195) ; Amani, alt. 750 m. (Greenway 1051, 1079, 3337) ; Ulugurus, Tanana, alt. 1000 m. (Miss E. M. Bruce 616 and 755) ; Makuyuni District, alt. 400–1000 m. (Koritschoner 724 and 1444).

NEW SPECIES AND VARIETIES OF THE PERSIAN FLORA : II *

by Dr. A. Parsa.

Malvaceae.

Alcea (§ **Apterocarpae**) **kazerouni** *Parsa*, sp. nov. ab omnibus speciebus proximis foliis simplicibus nec lobatis differt.

Herba perennis. *Caulis* teres, elatus, 40–50 cm. altus, pilis parvis appressis paucis stellatis interdum intermixtis tomentellus. *Folia* petiolo 1·2–3 cm. longo striato tomentello suffulta, inferiora 5 cm. longa et 6 cm. lata, subcordato-ovata, apice obtusissima, margine irregulariter crenata, utrinque (subtus copiose) appresse stellato-tomentella ; caulina et superiora valde et sensim diminuta, ovato-oblonga, c. 3 cm. longa et 2 cm. lata, a basi subcuneata, margine crenulato-dentata. *Stipulae* ad medias in lobos 3 inaequaliter fissae. *Pedicelli* calyce duplo longiores, petiolo folii floralis aequales vel paullo longiores. *Bracteae calyculi* 6, in involucrum calyce paullo brevius lobis triangularibus marginibus integris apicibus obtusissimis stellato-tomentosum connatae. *Calyx* 5–6 mm. longus ad medium, vel paullo ultra medium, in lobos triangulares obtusos fissus, leviter subelevatim striatus, uti involucrum pilis stellatis densissime tomentosus. *Petala* alba, 20 mm. longa et 14–15 mm. lata, obovato-cordata, ungue flavido (in sicco brunneo) margine barbato medio glabro vel sparsim piloso instructa. *Achaenia* c. 3 mm. alta et 7–8 mm. lata, 20–23, torum fere totum occultantia, extra appresse stellato-tomentella, lateraliter elevatim canaliculato- reticulata, area semilunata vermiculari. *Semina* semilunata, margine glabra excepta utrinque puberula.

S. Persia. Kazeroun, between Ispahan and Shiraz, 9 May 1885, *Stapf* 986.

Alcea (§ **Apterocarpae**) **teheranica** *Parsa*, sp. nov. *A. lavateriflorae* (DC.) Boiss. affinis, sed caulibus glabriusculis, foliis hispidulis, segmentis oblanceolatis vel late linearibus, floribus pedunculatis nec sessilibus pallide violaceo-purpureis distinguitur.

Herba perennis, elata, caulibus sparse stellato-pilosis vel glabriusculis obtuse angulatis vel subcylindricis. *Folia* petiolata, petiolo 2 cm. longo striato stellato-piloso, forma et magnitudine varia, a basi cuneato palmatim 3–4-lobata vel partita, lobis obtusis ellipticis vel linearibus mediis oblanceolatis longioribus 2 cm. longis et 4–8 mm. latis, irregulariter serrato-dentata dentibus ovato-triangularibus acutis, utrinque pilis stellatis plus minusve, praesertim subtus, adpresse hispidula ; folia superiora diminuta, saepe triloba. *Stipulae* persistentes, ultra medium in lobos 3 triangulares fissae. *Pedicelli* infimi calyce duplo breviores. *Bracteae calyculi* 6, in involucrum calycis dimidium aequans lobis triangularibus a basi connatae. *Calyx* 15–18 mm. longus, ad 2/3 in lobos elongato-triangulares acutiusculos vel obtusos fissus, leviter elevatim striatus, uti involucrum pilis stellatis densissime tomentosis. *Petala* purpureo-violacea, obovato-obcordata, calyci triplo longiora, ungue flavido ima basi flavido-viridi margine densissime barbato medio glabro vel parcissime piloso instructa. *Achaenia* haud visa.

*Continued from Kew Bull. 1947, 22.

N. Persia. Near Teheran, 1500 m., in open ground, beautiful pink flowers, May–June, *Trott* 763.

Leguminosae.

Astragalus (**sect. Poterium**) **baba-alliar** *Parsa*, sp. nov. ex affinitate *A. fasciculifolii* Boiss. sed calycis dentibus tubo sextuplo brevioribus corolla pallide violacea differt.

Frutex 20–30 cm. altus, erectus, ramosus, ramis adpresse albo-tomentosis spinis armatis remote foliosis teretibus vetustioribus costis obsoletis a petiolo decurrentibus subangulatis. *Stipulae* minutissimae, a petiolo fere liberae, lanceolatae, acuminatae. *Folia* 2–3-juga, erectopatula interdum patentissima ; spinae rhachidis strictae, rigidae, graciles, juniores tomentellae mox glabratae, albidae demum fuscae ; foliola 3–5 mm. longa et 1–2 mm. lata, sessilia, obovato-spathulata vel cuneato-obovata, retusa, interdum mucronulo brevissimo terminata, omnia parce et adpresse hirsuta. *Pedunculi* ex axillis ramulorum secundariorum solitarii, uniflori, hirsutuli, calycis longitudini fere aequales filiformes, articulati, bractea solitaria minuta elliptica vel obovato-elliptica ad articulationem et bracteolis duabus conformibus aequilongis ad calycis basin praediti. *Calyx* parce et laxe hirtulus, sub anthesi turgido-cylindraceus, dein elliptico-ventricosus, demum elliptico-subglobosus, pulchre reticulatus, dentibus tubo sextuplo brevioribus. *Corolla* violacea, calyci 1/3 longior ; vexilli lamina leviter resupinata, obovato-orbiculata, emarginata, ex ungue angusto sensim dilatata eique fere aequilonga ; alae liberae, laminis unguibus 4–5-plo brevioribus. *Legumen* immaturum.

S. Persia. Fars, Kuh Dasht, 7 May 1885, *Stapf* 826.

Astragalus (**sect. Malacothrix**) **birdjandicus** *Parsa*, sp. nov. *A. plebeio* Boiss. affinis, a quo floribus violaceis, calyce tubuloso dentibus tubo aequilongis, vexillo emarginato, leguminibus oblongis differt.

Planta acaulis, pulvinata, adpresse tomentoso-cinerea, e rhizomate indurato caudiculos multos crassos emittens. *Stipulae* lanceolato-triangulares basi breviter connatae, adpressiuscule albo-pilosae; foliola 6–10-juga, complicata, oblonga, utrinque sensim attenuata, adpresse albo-pilosa, obtusa, *Pedunculi* foliis aequilongi vel sublongiores, capitulo ovato laxo subracemiformi 5–10-floro. *Bracteae* lineari-filiformes, adpresse albo-pilosae, pedicello sublongiores. *Calyx* tubulosus, adpressissime albo-pilosus, subviolaceus, dentibus lanceolatis (2 mm. longis et 0·5 mm. latis) tubo aequilongis. *Vexillum* 6–8 mm. longum et 4 mm. latum, calycem subexcedens, alis parum longius, lamina ovata emarginata in unguem brevem angustata; carina apice abrupte caudata. *Ovarium* oblongum, dense et adpresse hirsutum.

E. Persia. Birdjand (Khorassan), 1900 m., 12 May 1939, *Parsa*.

Astragalus (**sect. Myrobroma**) **chrysanthus** *Boiss. et Hohen.* var. **elbursensis** *Parsa*, var. nov. racemis solitariis, pedunculis folia aequantibus vel subbrevioribus (nec superantibus), calycis dentibus tubo dimidio breviore distincta.

N. Persia. Elburz, 3000 m., *Parsa*.

Astragalus (**sect. Megalocystis**) **coluteopsis** *Parsa*, sp. nov. *A. coluteoidi* Willd. affinis, foliis 5–6 jugis, calycis dentibus tubo 8–10-plo (nec triplo) brevioribus, vexillo ovato-orbiculari retuso (nec obtuso suborbiculari) differt.

Suffrutex nanus, 3–10 cm. latus, ramosus, densius aut remotius foliosus, ramis villosis pennae columbinae crassitie. *Stipulae* concretae, ovato-lanceolatae, sensim acuminatae dense albo-tomentosae. *Folia* 5–7-juga, erecta aut erecto-patula, spina rhachidis flavescente nunc elongata rigida sed tenuiore nunc breviore firma et rigidiore basi inter stipulas callosa, tomentella virescentia, foliolis 2 mm. longis et 1 mm. latis apicem versus diminutis ellipticis obtusis incano-tomentosis patulis. *Pedunculi* solitarii ex axillis inferioribus ramorum, cum spica pauciflora foliis breviores, flexuosi aut declinati, tomentelli. *Flores* brevissime pedicellati, potius subsessiles, erecto-patuli. *Bracteae* ovato-ellipticae, hirsutae, ciliatae, caducae. *Bracteolae* binae ovato-acuminatae, calyce duplo aut quadruplo breviores. *Calyx* leviter tomentellus, tubo cylindraceo, purpurascenti-striatus, membranaceus, dentibus setaceo-subulatis tubo 8–10-plo brevioribus. *Corolla* pallide lutea calyce vix longior ; vexillum ex ungue latiusculo in laminam ovato-orbicularem retusam abiens ; alae liberae laminis ungue duplo brevioribus. *Ovarium* breviuscule stipitatum, suborbiculare, villosum, stylo glabro 3–4-plo brevius. *Calyx fructifer* ovato-subglobosus, dentibus inflexo-conniventibus, pulchre rubro-nervosus et reticulatus, legumen breviter stipitatum ellipticum compressum includens.

S. Persia. Fars, Siwend, on rocky slopes above the village, 14 July 1885, *Stapf* 2764 (young plants), 2765 (type).

Astralagus (**sect. Poterium**) **cornutus** *Bunge* var. **glaber** *Parsa*, var. nov. a typo calycis dentibus glabris recedens.

Persia. Khorramabad (Lorestan), 20 Apr. 1936, *Parsa* 657.

Astragalus (**Sect. Platonychium**) **etezadianus** *Parsa*, sp. nov. ab *A. mesoleio* Boiss. differt foliolis mucronulato-pungentibus (nec in spinulam longiusculam attenuatis), calycis dentibus triangularibus tubo triplo brevioribus, vexilli lamina ungui aequilata et aequilonga ; ab *A. atropatano* Bge. et *A. keyserlingii* Bge. differt stipulis haud abrupte et tenuiter acuminatis, bracteis haud acuminatis vel mucronatis, stylo glabro nec hispidulo ; ab *A. hysogeton* Bge. differt stipulis et bracteis haud acuminatis, calycis dentibus haud lanceolatis imo apice haud denudatis, stylo glabro (nec inferne hispidulo).

Fruticulus caespitosus, 20–25 cm. altus ; rami elongati, 10–20 cm. longi (axem principalem longitudine saepe subaequantibus), foliis et spinis erecto-patentibus tectis, spinis primum 1·5 serius 2 cm. longis subteretibus siccis flavescentibus et glabrescentibus. *Foliola* 5–8-juga, linearia vel lanceolata, supra villosula demum glabrescentia, carnosula, 1–3 mm. longa, 0·5–1 mm. lata, stipulis e basi late ovata sensim acuminatis stramineo-fulvis cum dorso (apice) saepe purpureo-tincto ad medium usque tomentellis in parte superiore glabrescentibus. *Flores* geminati axillares, secus totam ramorum longitudinem spicatim ordinati, bracteis navicularibus carinatis apice saepe subrecurvatis et glabrescentibus demum parce villosulis. *Calyx* parte basali glaber, supra dense albo-

villosus, dentibus triangularibus villosissimis tubo calycino triplo brevioribus. *Corolla* 4–6 mm. longa ; vexillum platonychium medio plicato-constrictum, apice rotundatum, retusum ; ala vaginae stamineae adnata, lamina unguem suum filiformem aequante, oblonga, uno latere auriculata, vexillum longitudine subaequans, cum carina subaequali basin versus connata. Stamen vexillare liberum. *Ovarium* (basi et medio exceptum) albo-villosum ; stylus ovario paulo longior, filiformis, glaber.

S. Persia. In Firuz Kuh, 2000 m., 22 June 1938, *Parsa.*

The most important characters of our plant on the basis of Boissier's classification, are : the boat-shaped and not acuminate bracts, the absence of bracteoles ; leaflets appressed-canescent, or glabrescent, shortly mucronate ; axils 2-flowered, forming a long spike ; calyx very villous ; limb of standard retuse.

In general appearance *A. etezadianus* resembles *A. verus* Oliv. but this species (as *A. turrillianus* and *A mishouensis* Turrill) has a broad claw to the vexillum (*Platonychium*) or rather the claw is scarcely distinguishable from the lamina.

Astragalus (**sect. Campylanthus**) **hafez-shirazi** *Parsa*, sp. nov. ab *A. susiano* Boiss. foliis 4–5-jugis (nec 9–10-jugis), foliolis glabris (nec tomentellis), calycis dentibus triangularibus erectis (nec subulato-filiformibus) incurvatis differt.

Frutex pumilus (15 cm.), ramosus, nunc densius nunc remotius foliosus, erinaceus, ramis erectis gracilibus tomentosis. *Stipulae* ovato-lanceolatae, subulatae, subtrinerviae, hyalinae et mox marcescentes, ciliatae. *Folia* patentia 4–5-juga, 3–3·5 cm. longa. *Spina* rhachidis flavescens, recta, stricta, basi utrinque callis duobus lutescentibus secus caulem adnatis, tomentella. *Foliola* elliptica, spinuloso-mucronulata, complicata, crebra, patula, glabra, 2 mm. longa. *Pedunculus* biflorus, floribus 3–4 mm. longis, sessilibus. *Bracteae* ovato-lanceolatae, uninerviae. *Calyx* campanulatus tenuiter membranaceus, villis longis mollibus vestitus, dentibus triangularibus erectis tubo duplo brevioribus. *Corolla* 4–5 mm. longa, calyci aequilonga. *Vexillum* lamina suborbiculata, resupinata, ungui obovato-elliptico aequilonga. *Alae* liberae, lamina unguibus vix longiore. *Ovarium* ellipticum, villosum, alis vix longius.

S. Persia. Near Kuh Bamu, Roknabad, Shiraz, 7 Jul. 1885, *Stapf* 2567.

Astragalus (**sect. Chronopus**) **mobayenicus** Parsa, sp. nov. *A. tomentoso* L. maxime affinis.

Fruticulus, pilis basifixis, tomentoso-incanus, caulibus striatis elongatis (20–30 cm. altis). *Folia* 5–20 cm longa, imparipinnata, petiolo 1·5–2·5 cm. longo, parte foliolato multo breviore, foliolis 12–14-jugis molliter villosis planis obovatis 4–6 mm. longis 3–4 mm. latis, stipulis majusculis albo-villosis lanceolatis acutiusculis. *Racemi* axillares, erecto-adscendentes foliis subtriplo breviores, floribus (2–5) remotis longiuscule pedicellatis (pedicellis 2–2·5 mm. longis) ; bracteis lineari-lanceolatis albo-pilosis pedicello sub- vel duplo-longioribus. *Calyx* florifer longe tubulosus, 8–10 mm. longus, 2–2·5 mm. latus, basi truncato ; tubo

calycino extra longe albo-villoso ; dentibus triangulari-subulatis tubo subbrevioribus pilis longis albis villosissimis. *Corolla* citrina, calyce paullo longior (15 mm. longa) ; vexilli lamina molliter villosula, oblongo-elliptica, retusa, alas carina longiores superante. *Legumen* 10–14 mm. longum et 5 mm. latum, patule villosum, durum, cylindrico-subturgidum in rostrum attenuatum, subcurvatum, ventre sub-concavo carinatum, dorso convexo sulcatum, seminibus glabris reniformibus, viridibus.

S. Persia. Lar (Fars) 700 m., 15 April 1939, *Parsa*.

Closely allied to the Egyptian *A. tomentosus* Lam. from which it differs by : the leaflets not orbiculate-obcordate ; flowers not sessile ; calyx tubular and not campanulate ; calyx-teeth triangular-subulate, shorter than the tube ; standard retuse (not obtuse) ; pods not subcompressed.

Astragalus (**sect. Poterium**) **myriocystis** *Bornm.* var. **albiflorus** *Parsa*, var. nov. flore albo et carina retusa distincta.

S. Persia : steppe of Lar, 1200 m., 14 Apr. 1939, *Parsa* 653.

Astragalus (**sect. Megalocystis**) **sivandi** *Parsa*, sp. nov. ab *A. murino* Boiss. stipulis ellipticis acutis, foliis 3–5-jugis foliolis obtusis, pedunculis foliis longioribus, racemis congestis, calycis dentibus tubo duplo brevioribus differt.

Suffrutex ramosus, dense foliosus et hystricinus, ramis dense caespitosis tomentosis *Stipulae* concretae, ellipticae, acutae, hyalino-membranaceae, nervosae, villosae, ciliatae. *Folia* patulo-erecta 3–5-juga 1–2 cm. longa spina rhachidis flavescente recta, stricta rigida cano-tomentosa ; foliola pectinato-patula, approximata, apicem versus decrescentia, 1·5–2 mm. longa et 5 mm. lata, obovato-elliptica vel linearia, obtusa. *Pedunculi* cano-tomentelli, solitarii, 5—10 cm. longi, cum racemis foliis longiores. *Racemi* abbreviati, 7 ad 10-flori, congesti, floribus sessilibus bracteis ovato-lanceolatis tomentosis suffultis. *Calyx* tubulosus, turgidulus, membranaceus, subreticulatus, pilis cinereis intricatis tomentellus, demum inflato-ventricosus 9 mm. longus, dentibus ovato-subulatis tubo duplo brevioribus. *Corolla* purpurescens calyci paullo longior. *Vexillum* obovato-orbiculatum, integrum vel subretusum, in unguem latum sensim angustatum. *Alae* liberae, unguibus lamina sublongioribus. *Ovarium* ellipticum, substipitatum, quadri-ovulatum, pubescens, stylo a basi puberulo.

S. Persia. Fars, Chah-Siah in Sivand, 16 July 1885, *Stapf* 2790, 2835 (type).

Astragalus (**sect. Aegacantha**) **taftanicus** *Parsa*, sp. nov. *A. stipitato* Benth. pedunculis foliis brevioribus, calycis dentibus tubo aequalibus, petalis luteis, legumine hirtulo recedens.

Fruticulus acaulis, humilis, petiolis vetustis horridus ; caudiculi breves. *Stipulae* magnae, triangulares, albo-membranaceae, hirtulae, acuminatae, dorso reticulatae, basi connatae ; folia cum rhachide 3–6 cm longa, foliolis 3–6-jugis ovato-ellipticis pungentibus utrinque adpresse sericeo-canis (2–2·5 mm. latis, 4 mm. longis) subsessilibus. *Racemi* longe pedunculati, 4–5-flori, folio subbreviores, pedicellis tubo calycino vix brevioribus, bracteis albo-membranaceis triangularibus pedicellum aequantibus.

Calyx tubulosus, pallide roseus, pilis albis sparsim vestitus, dentibus triangularibus tubum aequantibus. *Corolla* flava, glabra, vexillo 5 mm longo et 2·5 mm. lato calyce subduplo longiore lamina retusa, alis angustis. *Ovarium* oblongum, hirsutulum. *Legumen* albo-hirtulum 7–10 mm. longum et 2–3 mm. latum, subturgidum, utrinque attenuatum, mucronatum.

S. Persia. Taftan (South), 2200 m., 9 May, 1939, *Parsa* 658.

Var. **multiflorus** *Parsa*, var. nov. a typo floribus 12 usque, racemis folia aequantibus vel longioribus distincta.

S. Persia. Khafr (Shiraz), 1400 m., 12 April 1939, *Parsa*.

Astralagus (**sect. Harpilobus**) **tenuirugis** *Boiss.* var. **brevipedunculatus** *Parsa* var. nov. racemi pedunculo folio subbreviore calycis dentibus tubo duplo brevioribus distincta.

S. Persia. Laristan, Mansurabad, 900 m., 13 Apr. 1939, *Parsa* 943.

Astragalus (**sect. Proselius**) **trottianus** *Parsa*, sp. nov. *A. schizoptero* Boiss. affinis.

Radix crassa, lignosa, perpendicularis vel subobliqua, nigra, 25–35 cm. longa, multiceps; caudiculi numerosi, subcrassi, lignescentes, plerumque squamosi (basi foliosi), nani, 1·5–2 cm. longi. *Folia* 12–14-juga, longe petiolata, 5 cm. usque longa, foliolis elliptico-orbicularibus obtusiusculis, cum rhachi utrinque dense et adpresse cano-pilosis 1·5–2 mm. longis, 1 mm. usque latis, stipulis triangulari-lanceolatis liberis, adpresse albo-pilosis. *Pedunculi* 2–4 axillares, folia superantes vel subaequantes, in racemos laxos (2–5-floros) abeuntes. *Flores* erecti vel subpatuli, magni, 20–22 mm. longi, breviter pedicellati ; bracteis lanceolatis subrubris adpresse albo-pilosis pedicellum aequantibus ; bracteolae duae, minimae (1·5–2 mm. longae), lineares, albo-pilosae, calycis tubo adpressae. *Calyx* longe tubulosus, 9–11 mm. longus, angustatus, supra basin gibboso-truncatus, adpresse albo-pilosus, dentibus tubo sub-brevioribus lanceolato-linearibus. *Corolla* lutea ; vexillum subpanduriforme, basin versus cuneatum, apice rotundatum, ungue suo subbrevius ; lamina alarum carinam subaequans, retusa, ungue suo sublongior, late et breviter auriculata. *Legumina* erecta vel patula, linearia, adpresse albo-hirtula, recta vel subincurva, 3–5 cm. longa, breviter stipitata, abrupte longe (5–7 mm.) et tenuiter hamato-cuspidata, dorso profunde sulcata, ventre subcarinata, 12–15-sperma.

N. Persia. Ad Hadjilar (Gorgan), 3 May 1935, *Parsa* 144.

Closely allied to *A. schizopterus* Boiss. but remarkable for the length of the pods. It also differs in the number of leaflets, size of the peduncles, fruit lacking the black hairs, wings not bilobate.

Astragalus (**sect. Platonychium**) **turrillianus** Parsa, sp. nov. *A. ochrobio* Bunge affinis.

Frutex, subelongatus, erinaceus, erecto-patule armatus. *Rami* breves, intricati, brunnei, spinis tenuibus numerosissimis intricatis horridi. *Stipulae* coriaceae, foliorum infimorum triangulares, acutae, summorum

stramineae oblongae sensim acuminatae, apice mox sanguineae, basi excepta longe villoso-lanatae. *Foliola* 5–8-juga, elliptico-linearia, spinulosa, supra viridia, glabra, subtus cum rhachide plus minus patule albo-hirsuta. *Inflorescentiae* 10–12-florae, in capitulum terminale ovato-globosum congestae ; bracteae calyce subbreviores, lineari-oblongae, naviculares, albo-hyalinae, acutae, laxiuscule villosae, summae mox sanguineae. *Flores* majusculi, flavidi (aurei) ; calyx facile fissilis, villosissimus, basi glaber, dentibus lineari-subulatis rectis tubum aequantibus ; vexillum calyce sublongius, bracteas et stipulas duplo superans, lamina leviter panduriformi obtusissima, ungue obtriangulari angustiore et multo breviore, carina et alis sublongius. *Ovarium* glabriusculum vel sparse hirtulum, ovulis 8 instructum.

N. Persia. In declivibus Kojur prope Namazgah, 3300 m., 2 Aug. 1940, *Parsa*.

Dimensiones : frutex 15–25 cm. altus, pulvinum 20–40 cm. latum formans, trunco 3–4 mm. crasso, ramis sub tenuioribus 4–8 cm. longis ; spinae 2–3 cm. longae ; capitula centimetrum diametro vel paulo crassiora 5–10 mm. longa ; stipulae 2·5–3·5 mm. longa, 1·5–2 mm. ad medium lata ; bractea, 1·5–3 mm. longae ; calyx cum dentibus 4 mm. longus ; vexillum fere 2 mm. 5 latum, lamina 4 mm. 5 longa ungue minimo (1 mm.) ; alae carinaque vexillo subbreviores.

The plants of this section show a wide range of characters in various combinations and the species are difficult to characterize. *A. turrillianus* approaches *A. ochrobius* Bge. morphologically but differs from it in the spines not spreading ; leaflets minutely prickly and not with long spines; the flowers of our plant form an ovate-globose (not ovate-oblong) head; the bracts are not mucronate, the calyx-teeth are linear-subulate, and the standard is not retuse.

Astragalus (subgen. Phaca, sect. Hemiphragmium) videus *Parsa*, sp. nov. *A. microdonto* Baker affinis.

Herba perennis, caulibus elongatis striatis ramosis tenuiter adpresse albo-pubescentibus. *Folia* viridia, tenuissime pubescentia ; petiolus brevis, 1·5—3 cm. longus, stipulis cum parte sua basali petiolis foliorum adnatis inter se brevissime connatis triangulari-lanceolatis acuminatis albo-pilosis pilis nigris insuper inmixtis (basi circa nodos nigro-pilosis) ; foliola 9–12-juga, lineari-oblonga vel oblonga, obtusa, acutiuscula, vel mucronulata, 5-12 mm. longa, distincte petiolulata, subtus albo-hirsuta supra glabrescentia ; rhachides 10–15 cm. longae. *Racemi* densi, 2–4 cm. longi, multiflori, pedicellis 0·5–1 mm. longis, bracteis membranaceo-hyalinis nigro-pilosis cito deciduis calyce subtriplo brevioribus. *Calyx* breviter campanulatus, nigro-pilosis, dorso oblique truncatus, 2–3 mm. longus, dentibus triangularibus tubo triplo brevioribus. *Corolla* lutea, calyce duplo vel paulo longior, vexillo apice emarginato basin versus in unguem angustum diminuto. *Legumen* hirtulum, lineare, subcompressum, 5–7 mm. longum, 1·5–2·5 mm. latum, ad apicem et basin angustatum, perfecte biloculare, subsessile, seminibus 5–7.

S. Persia. Elika, 2600 m., 3 July 1941, *Parsa* 210.

Closely allied to the Shendtoi *Astragalus microdontus* Baker (Journ. Linn. Soc. **18,** 46 : 1881), from which it differs by the hyaline black haired bracts and the hairy (not glabrous) sessile (not pedunculate) fruits. This plant is also a neighbour of *A. stenostachys* G. Beck. I first mistook it for *A. stenostachys*, but the dissection shews that it differs in : the number of leaflets : 9–12 pairs (instead of 6–10) ; flowers always crowded and incurved (and not straight) ; bracts only black-hairy (and not densely white-black) ; cal. tubular campanulate (and not tubular) ; teeth of calyx triangular (instead of subulate) ; flowers yellowish and not purpurescent.

Astragalus (**sect. Microphysa**) **yazdekhast** *Parsa*, sp. nov. ab *A. callistachide* Boiss. et Buhse calycis dentibus pilosis tubo brevioribus, ab *A. reuteriano* Boiss. vexillo integro, ab *A. microphysa* Boiss. calycis dentibus tubo brevioribus vexillo integro differt.

Suffrutex erectus, 15 cm. altus, ramosus, dense foliatus et hystricinus, ramis lanato-tomentosis pennae anserinae crassitie. *Stipulae* concretae, parte libera ovatae, hyalinae, acuminatae, nervosae, laxe lanato-tomentosae. *Folia* 3-6-juga, erecto-patula, 4–5 cm. longa ; spina rhachidis lanato-tomentosa, virescenti-incana demum flavescens et glabrata ; foliola remota, elliptica vel oblanceolata 8–15 mm. longa et 2–3 mm. lata, spinulis flavidis terminalibus mucronulata, dense cano-tomentosa. *Calycis* dentes triangulari-lanceolati, acuti, tubo paullo breviores, legumine maturante magis inflexi et orificem claudentes. *Corolla* purpurea (?) calycis longitudine ; vexillum lamina resupinata orbiculari integra abrupte in unguem angustum attenuata ; alae liberae. *Ovarium* obovato-orbiculatum, compressum, villosum, stylo brevi villoso triplo longius.

S. Persia. Fars, between Amirabad and Yazdekhast, 11 Sept. 1885, *Stapf.*

Vicia tenuifolia *Roth* var. **filiformis** *Parsa* var. nov. stipulis filiformibus nec semihastatis distincta.

N. Persia. Chalus valley, 2400 m., 3 July 1940, *Parsa.*

Rosaceae

Potentilla kotschyana *Fenzl* var. **tomentosa** *Parsa*, var. nov. caulibus diffusis (haud adscendentibus) ; tota planta tomentosa (nec virescens) distincta.

N. Persia. Namazgah, 3100 m. 1 July 1941, *Parsa* 211.

Potentilla pannosa *Boiss. et Haussk.* var. **longicaulis** *Parsa*, var. nov. caulibus valde elongatis distincta.

N. Persia. Kojur, 3400 m., 3 Aug. 1940, *Parsa* 814.

Potentilla pimpinelloides *L.* forma **nana** Parsa, f. nov., habitu humiliore, 5–10 cm. alta tantum, distincta.

N. Persia. Gaduk, 1800 m., 18 June 1941, *Parsa* 160.

Rosa microbothra *Parsa*, sp. nov. planta viscosa aculeis inaequalibus floribus pedunculatis distincta.

Frutex, ramis suberectis glaucis glabris, heteracanthus : aculeis aliis albis creberrimis brevibus setiformibus glanduliferis, aliis plus minus validis interdum validissimis basi dilatatis aduncis incurvis vel rectis. *Foliola* 5–7 (1–4 cm. longa) subobovata vel elliptico-ovata, subconcoloria, sub-duplicato-serrata, supra viridia, hirtula, vix glandulosa, subtus pallide glanduloso-tomentosa, petiolo velutino-glanduloso, stipulis dilatatis velutino-glandulosis. *Flores* solitarii, albi vel lutei, longe pedunculati, pedunculis (vix 2 cm. longis), dense aciculato-glandulosis. Calycis tubus ellipsoideus minimus spinulosus utrinque attenuatus ; laciniae velutino-glandulosae erectae exteriores pinnatifidae lobo terminali majusculo duplicato-dentatae.

N. Persia. Pole Zanguleh, in steppe, 2400 m., 14 June 1937, *Parsa* 853.

The species described has been difficult to place satisfactorily in any of Boissier's sections of the series A. (*styli liberi ultra tubum calycis parum vel non producti*).

The most important characters of our plant, on the basis of Boissier's classification, are : prickles unequal, some needle-like, others stout, curved or straight, all the plant glandular-viscous, flowers peduncled (§ 6. *Orientalis* but flowers white and not pink). It is distinguished from the section *Rubiginosae* by prickles unequal ; so perhaps it is a hybrid of *R. iberica* Boiss. (Fl. Or. **2,** 687) and *R. orientalis* Dupont (Boiss. Fl. Or. **2,** 680).

Umbelliferae.

Carum elvendia *Boiss.* var. **filiforme** *Parsa*, var. nov. foliis superioribus laciniis filiformibus, umbellis 8-radiatis distincta.

N.W. Persia. 17 miles south of Khoi, 5000 ft., 12 May 1929, *Parsa*.

Daucus flavus *Parsa*, sp. nov.

Biennis, patule et molliter villosus pluricaulis. *Caulis* elatus (40–80 cm.) a basi ramosus. *Folia* ambitu oblonga, petiolo vix inflato suffulta, bipinnatisecta divisionibus primariis haud petiolulatis sed attentuatis, secundariis haud profundis lineari-lanceolatis minute mucronatis. *Umbellae* longe pedunculatae inaequaliter 20–30-radiatae involucri phyllis persistentibus viridibus trisectis, segmentis lineari-subulatis longe acuminatis margine albo-scariosis sparse ciliatis vel glabris, apice purpureis, involucelli phyllis linearibus integris viridibus apice purpureis acuminatis glabris pedicellis brevioribus. *Petala* glabra, flava, elliptica. *Fructus* pedicellis subtriplo breviores, purpurei vel violacei setis minutis albis obsiti, stylopodiis conicis parvis stylis subtriplo longioribus superati. N. Persia. In damp depression of Keredj (Tehran), 23 June 1935, *Parsa* 149.

This species has nearly the flowers of *D. carota* L. (Boiss. Fl. Or. 2, 1076) but is readily distinguished from it by the leaves with linear segments, the entire bracts of the involucel, the yellow flowers and the much smaller fruit.

Daucus glaber *Parsa*, sp. nov.

Perennis (?), a collo pluricaulis, caulibus 17–20 cm. altis glabris striatis. *Folia infima* petiolo elongato (7–10 cm. longo) striato in vaginam sub-

crassam basi dilatato c. 20 cm. longo suffulta ; lamina ambitu late triangularis in segmenta rigida elliptica obovata vel orbiculata decurrentia bi-tripartita glabra albo-serrata acuta bipinnatisecta. *Folia superiora* diminuta segmentis usque 2 cm. longis et 7–10 mm. latis. *Folia ultima* minuta. *Umbellae* terminales, 15-20 radiatae, radiis inaequalibus glabris c. 3–6 mm. longis. *Involucri phylla* trisecta, umbellam aequantia ; involucelli lanceolata, longe acuminata, albo-marginata, integra, umbellula vix longiora. *Flores* minimi, non radiantes, (sicci) albi. Fructus ?

S. Persia. Pip, 1100 m., 6 May 1939, *Parsa* 74.

An ally of *D. littoralis* Sibth. but our plant differs from this and all other species of *Daucus* by the form of its leaves.

Ligusticum alatum *M. Bieb.* var. **pauciradiatum** *Parsa* var. nov. umbellis parvis pauciradiatis distinguenda.

N. Persia. Korjur, 2800 m., 16 July 1940, *Parsa* 703.

Trachydium eriocarpum *Parsa*, sp. nov. indumento tomentoso et fructus forma insignis.

Planta perennis, 20 cm. alta, rhizomate crassiusculo. *Caulis* solitarius, simplex vel dichotomus, erectus, ± albo-pannoso-tomentellus. *Folia* radicalia vel subradicalia 4–8, 2–3 cm. longa, albo-tomentosa, elongata, bipinnatisecta, vagina 5–10 mm. longa, 2–3 mm. lata, segmentis minutis ovatis in lacinulas lineares sensim acutas confertas partitis ; folium caulinum 1, radicalibus subsimile sed minus, petiolo multo redacto vel ad vaginam magnam et laminam perpusillam (bipinnatisectam) redactum. *Umbellae* inaequaliter 3–5 radiatae ; umbellae radii 5–20 mm. longi, tomentelli ; involucri et involucelli phylla triangularia, longe acuminata, albo-marginata. *Sepala* inconspicua. *Petala* lutea, glabra, obovata, saepe retusa. *Fructus* longe pedicellatus (pedicello 2–3 mm. longo), elliptico-orbicularis, albo-pannosus, stylopodio purpureo late disciformi stylisque deflexis stylopodio longioribus superatus, jugis inconspicuis.

N. Persia. Praeter Kojur, 3200 m., 2 July 1940, *Parsa* 705.

Sium lancifolium *M. Bieb.* var. **elongatum** *Parsa*, var. nov. foliis pinnatisectis-lyratis segmentis terminalibus pinnatipartis elongatis.

N. Persia. Hills above Gilas, 65–7500 ft., 29 May 1929, *Parsa*.

Rubiaceae.

Galium verticillatum *Danth.* var. **longiflorum** *Parsa*, var. nov. corolla majuscula ovario superante distincta.

N. Persia. Nur, 1900 m., *Parsa* 710.

Compositae.

Anthemis gayana *Boiss.* var. **hispidula** *Parsa*, var. nov. planta hispidula nec tomentoso- canescens a typo recedit.

S. Persia. Ispahan, May–June 1944, *Iliff* 26, 27.

var. **multiramosa** *Parsa*, var. nov. caulibus scapiformibus inferne multiramosis distinguitur.

S. Persia. Near Shiraz, *Trott* 937.

var. **rosea** *Parsa*, var. nov. ligulis pallide roseis nec albidis distinguenda.

S. Persia. Open ground and stony places near Shiraz, 1500 m., *Trott* 922.

Centaurea albinervis *Parsa*, sp. nov. e sectione *Acrocentrone* (*Euacrocentrae+Pupureae Boissier, Fl. Or. **3,** 618) insignis.

Radix perennis, multiceps ; caules erecti 35–40 cm. alti, albi, glabri, striati, simplices, monocephali. *Folia* radicalia plerumque longipetiolata, petiolo laminae subaequali vel paullo longiore ; lamina glabra, viridis, lanceolata vel elliptica, sinuato-undulata, nervo albo percursa, apice mucrone incurvo mucronulata ; folia caulina valde diminuta, inferiora subintegra oblanceolata petiolata, superiora molliter velutino-tomentosa lineari-lanceolata, basi auriculata vel integra ceterum integra vel unidentata, apice mucrone flavo tenui longiuscule mucronata. *Capitula* mediocria, longe pedunculata, ovato-hemisphaerica, involucri phyllis numerosis crispule villosis triangularibus subulato-mucronatis (mucrone erecto-patulo haud spinoso) flavidis. *Flores* purpurei, involucro sublongiores, marginales haud radiantes. *Achaenia* (immatura) compressa, brunnea, obpyramidata, glabra. *Pappus* albus achaenio duplo longior.

S. Persia. Shahzade Kuh, 3000 m., 1 July 1941, *Parsa* 324.

Centaurea reuteriana *Boiss.* var. **pinnatisecta** *Parsa*, var. nov. herba acaulis foliis pinnatisectis (nec integris nec lyratis) distincta.

N.W. Persia. Salt lake, 30 miles S.E. of Tabriz, 1800 m., 7 May 1929, *Cowan & Darlington* 752.

Centaurea urvillei *DC.* var. **longicaulis** *Parsa*, var. nov. caulibus foliis longioribus, involucri phyllis intermediis flosculis brevioribus achaeniis longe albo-velutinis differt.

N.W. Persia. 15 miles N. of Ushnu, 1800 m., 31 May 1929, *Cowan & Darlington* 1382.

Centaurea ustulata *DC.* var. **caulescens** *Parsa*, var. nov. a typo caule tripollicari et involucro villoso (nec glabro) differt.

N.W. Persia. Hills above Gilashe, 2100 m., 28 May 1929, *Cowan & Darlington* 2483 (type) ; hills above Band, 1500 m., 14 May 1929, *Cowan & Darlington* 2105.

Chrysanthemum polezangulii *Parsa*, sp. nov. e sectione *Leucoglossa* DC., *C. gaubae* Bornm. affinis foliis pinnatisectis, segmentis ellipticis, involucri phyllis membranaceis purpureis, achaeniis multicostatis differt.

Frutex dumulosus, inferne lignosus cortice fusco demum fibroso-subsoluto, ramis novellis viridibus tenuiter puberulo-lanatulis canescentibus ; caulibus floriferis rectis c. 50–60 cm. longis, semper monocephalis et supra medium foliosis (foliis 12–18), in tertia parte superiore nudis vel foliis 1–2 minutis bipinnatipartitis obsitis. *Folia* utrinque eodem indumento crispulo-cinerascentibus, omnia sessilia, ambitu oblonga vel obovata, 3 cm.–4 cm. longa et 8–10 mm. lata, pinnatisecta segmentis remotiusculis, utriusque lateris 3–7, ellipticis vel obovatis c.

3–5 mm. longis et 1–2 mm. latis pinnatipartitis lobulis crassiusculis linearibus integris vel paucidentatis apice et dentibus spinulosis. *Capitulum* solitarium, majusculum, cum ligulis valde radiantibus 3–3·5 cm. diametro. *Involucrum* hemisphaericum, 1–1·5 cm. latum et 3–4 mm. altum, phyllis membranaceo-stramineis glabriusculis vel tenuiter praesertim ad apicem versus subaraneosis ad marginem tenuiter ad apicem late purpureis dorso nervo medio purpureo percursis. *Flosculi* marginales lamina radiante alba oblonga vel elliptica vel spathulata 8–10 mm. longa et 3 mm. lata apice obtussissima et saepe 2–3 crenata nervis 10–12 percursa; flosculi disci flavidi, glabri, apice 5–fidi. *Achaenia* matura brunnea 1·5–2 mm. longa et vix 1 mm. lata, recta, pluricostata, inter costas hirtula.

N. Persia. Pole Zanguleh, 2400 m., 21 July 1938, *Parsa* 708.

Chrysanthemum (**Pyrethrum**) **sanguineum** *Parsa*, sp. nov. *C. szovitsii* (C. Koch) Bordz. (*Pyrethro polyphyllo* Boiss.) affinis sed laciniis foliorum linearibus acutis vel abrupte flavido-mucronatis glandulis obsoletis, involucro glabro differt.

Planta perennis, rhizomate ramoso caules foliatos et florentes emittente. *Caules* complures, erecti, 10–45 cm. alti, striati glabri, sanguinei, ad apicem usque (ad dimidium dense supra parce) foliati, simplices, monocephali vel ramis 1–3 plus minusve elongatis monocephalis corymbum pauciflorum formantibus instructi. *Folia* glaberrima, sessilia, oblongo-elliptica, 1–2 cm. longa et 4–5 mm. lata, bipinnatisecta, segmentis utrinque 8–12 linearibus approximatis mediis cum segmentis secundariis paucis diminutis linearibus apice mucronatis ; rhachis angusta et integra. *Capitula* solitaria, terminalia, 3 mm. longa et 5 mm. diametro, hemisphaerico-campanulata ; involucri phylla albo-viridia, glabra, spathulata, margine hyalino dilatato praesertim ad apicem circumcincta, apice hyalino-lacerato ; receptaculum parum convexum. *Flores* 2·5 mm. longi numerosi, ligulis trilobis albis involucrum duplo superantibus marginales hermaphroditi ; flores disci tubo breviter 5-fido. *Achaenia* immatura, cylindracea, alba, incurvata.

N. Persia. Meshkambar, 1500 m., 14 June 1941, *Parsa* 171.

Cirsium spectabile *DC.* var. **araneosum** *Parsa*, var. nov. involucri phyllis araneosis nec glabris a typo recedit.

S. Persia. Mollah Zadeh, Shiraz, 16 June 1885, *Stapf* 1872.

Cousinia (§**Drepanophorae**) **azerbaijanensis** *Parsa* sp. nov., affinis *C. brachypterae* DC. sed habitu bienni (nec perenni), flosculis 8–12 luteis (nec 20–30 roseis) differt.

Herba biennis, adpresse albido-lanuginosa, caule humili (10–12 cm. alto) parce et breviter corymboso-ramoso basibus foliorum caulinorum decurrentibus anguste et breviter alato, alis remote et breviter spinulosis. *Folia* radicalia haud alata, subsessilia, lanceolata in segmenta oblongo-lanceolata in spinam flavidam attenuata pinnatisecta ; caulina subconformia sed decurrentia. *Capitula* ovato-globosa breviter et graciliter spinosa (diametro 4–6 cm. absque spinis), subsessilia ; involucrum parce arachnoideum, phyllis e basi ovata adpressa in spinam brevem atten-

uatis, extimis saepius vix brevioribus reflexis, mediis patento-recurvatis, intimis erectis, scariosis dorso villosulis, margine serrulatis, floribus vix brevioribus ; receptaculi setae laeves. *Flores* circa 8–10, lutei. *Achaenia* 3–5-costata, verruculosa-scrobiculata, pappi setis scabris caducis.

N.W. Persia. Steppe of Sarab (Ardebil of Azerbaijan), 1900 m., 24 Sept. 1938, *Parsa* 278.

var. **elongata** *Parsa*, var. nov., caulibus robustioribus 15–20 cm. altis, foliis paulo majoribus caulinis haud decurrentibus a typo recedit.

N.W. Persia. Azerbaijan ; 12 miles east of Sarab, 1650 m., 15 June 1929, *Cowan & Darlington* 1585.

Cousinia (§**Brachyacanthae**) **charmekaniana** *Parsa*, sp. nov. *C. stenocephalae* Boiss. valde affinis sed foliis radicalibus valde elongatis utrinque dense tomentosis (nec supra glabrescentibus), capitulis pedunculatis (nec sessilibus), involucri phyllis 30 (nec 12–15) differt.

Perennis, caule 30–40 cm. alto parce araneoso a basi subdichotome ramoso laxe corymboso. *Folia* coriacea reticulato-venosa, subtus elevatim nervosa, crebre et profunde lobata, lobis triangularibus in spinas flavidas abeuntibus ; radicalia oblongo-lanceolata, 20–25 cm. longa, spinis inclusis circiter 5 cm. lata, utrinque dense albo-tomentosa, in petiolum attenuata ; caulina inferiora longe petiolata, superiora basi auriculata (auriculis triangularibus acutis), breviter adnata vel subsessilia, summa diminuta ovato-lanceolata integra vel utrinque 1–2-spinulosa, capitula superantia. *Capitula* breviter pedunculata, solitaria vel bina, ovato-oblonga, pluriflora ; involucrum parce albo-villosulum, phyllis circiter 30 adpressis lanceolato-subulatis margine serratulis apice in spina lutea recurva abeuntibus intimis stramineis apice purpureis rectis ; flosculi et achaenia haud visa.
S. Persia. Kuh Cheng, 27 May 1885, and Khoma Zaenian (Kuh Charmekan), 4 June 1885, *Stapf*.

Cousinia (§**Heteracanthae**) **daryoushiana** *Parsa*, sp. nov. *C. dichroanthae* Bornm. et Gauba affinis, a qua foliis minus tomentosis, bracteis apicibus purpurascentibus fere erectis, floribus 7–10 (nec 18–20), receptaculi pilis albis brevibus (nec flavidis et 1 cm. longis), achaeniis apice truncatis, acute denticulatis differt.

Planta pedalis vel altior, ut videtur perennis, a basi late et dense ramosa, ubique adpresse incano-araneosa, foliis subaequaliter vestitis, et caulibus et ramis et ramulis late foliosis et interrupte decurrenti-alatis, ramulis 15–20 cm. longis patentibus apice 1–3-cephalis ad capitula usque foliatis, capitulis pedunculo circiter 1 cm. longo tenui suffultis folia summa subaequantibus. *Folia* radicalia ignota ; caulina omnia coriacea, utrinque araneosa, sessilia, oblongo-triangularia vel oblonga, (alis latis adnatis), 5 cm. usque longa et 2–3 cm. lata, margine triangulari-spinoso-dentata, subtus nervis prominentibus valde reticulata, nervis in spinam horizontalem acerosam flavidam longiusculam horridulam exeuntibus ; folia ramulorum ovata vel ovato-triangularia breviter decurrenti-adnata, margine spinulosa, supra viridia, summa capitula haud occultantia. *Capitula* tenuiter pedunculata, ovata, floribus inclusis 1·5–2 cm. longa et cum involucri phyllis brevibus subpatentibus

circiter 1–1·5 cm. lata ; involucri phylla imbricata, viridia, apice purpurascentia, araneosa ; phylla extima (infima) brevia, sequentia sensim elongata, lanceolata, parte exserta squarroso-erecta nervo crassiusculo percursa spinulam longiusculam flavam gerentia ; phylla intima straminea linearia, apicem versus lanatula, purpurea. *Flores* 7–10, cum stylo exserto tubum antherarum eximie superante, 10–12 mm. longi straminei ; corolla tubulosa, tubo lobis triplo longiore, antherarum tubo et stylo purpureis. *Receptaculi* setae levissimae, albo-eburneae, circiter 5 mm. longae. *Pappi* setae circiter 10, inaequales, scabrae, 5 mm. longae. *Achaenia* pappo subaequilonga, fusca, 6–8-costata, apice truncata, acute et inaequaliter denticulata.

Persia. Steppe of Abr, 1500 m., 1 Jul. 1938, *Parsa* 96.

Cousinia (§ **Helianthae**) **declinata** *Parsa* sp. nov., *C. hablizlii* C. A. Mey. et *C. gmelini* Winkler affinis ; a *C. hablizlii* differt achaeniis papposis (nec epapposis) ; a *C. gmelini* differt achaeniis apice lobulatis (nec rotundatis edentulatis).

Herba (?), caulibus alatis (alis lobulato-spinosis) simplicibus monocephalis, 40–45 cm. altis albo-lanuginosis. *Folia* (radicalia desiderata) caulina media et summa longe decurrentia, pinnato-dentata dentibus spinis flavis glabris spinescentibus, omnia utrinque floccosa ; superiora sensim decrescentia. *Capitula* (2 cm. diametro absque spinis) obovata, solitaria, multiflora ; involucrum albo- et fusco-pannosum phyllis lineari-lanceolatis rigidule spinosis spinis brevibus nudis flavidis, exterioribus reflexis intermediis patenti-erectis, interioribus et intimis chartaceis exteriora et media superantibus lineari-lanceolatis supra medium sensim constrictis acuminatis vix spinescentibus ; receptaculi setae longissimae laevissimae. *Flosculi* colore pallidi ex sicco vix conspicui ; antherarum tubus glaber. *Achaenia* glabra, fuscescentia, compressa, ecostata, maculata, apice denticulata ; pappi setae scabrae, caducae.

N. Persia. Gaduk, 2200 m., 4 Aug., 1937, *Parsa* 270.

Cousinia gracilis *Boiss.* var. **erecto-patula** *Parsa*, var. nov. a typo involucri phyllis intimis crenulato-sinuatis (nec denticulato-laceratis), ceteribus in spinam brevem erecto-patulam abeuntibus recedens.

S. Persia. Kuh Dasht, Murgi Dalu, near Shiraz, 3 June 1885, *Stapf.*

Cousinia hypoleuca *Boiss.* var. **teraranica** *Parsa*, var. nov. foliis supra lucide viridia, inferioribus petiolatis pinnatisectis, involucri phyllis 50–75 (nec 45–50), capitulis 28–35-floris (nec 40–50-floris) a typo differt.

W. Persia. Tafresh, Mt. Doberaran, 2710 m., Jul. 1939, *Parsa.*

Cousinia intertexta *Freyn et Sint.* var. **floccosa** *Parsa*, var. nov. a typo tota planta dense floccosa, foliis haud coriaceis summis haud minoribus, involucri phyllis late triangularibus recedit.

N. Persia. Kandewan Pass, 40 miles N.W. of Teheran, July 1933, *Trott* 17.

Cousinia (§**Heteracanthae**) **kelardashtiana** *Parsa*, sp. nov. *C. apterae* Aitch. & Hemsl. affinis, a qua ramis monocephalis alatis, foliis supra viridibus, receptaculi setis contortis, floribus albis vel purpureis

(nec citrinis) involucro longioribus, achaeniis subscrobiculatis nigro-maculatis distinguenda.

Herba perennis, 10–20 cm. alta, ramis 2–3 gracilibus alatis ± floccosis monocephalis. *Folia* subsessilia, radicalia 8–10 cm. longa, profunde pinnatipartita lobis lanceolato-triangularibus graciliter flavido-spinosis, subtus albo-floccosa, supra viridia, subaraneosa. *Capitula* subsessilia, ovata, spinis exclusis circiter 10 mm. diametro, pleiantha ; involucri bracteae numerosissimae, maxima parte squarrosae, inferiores araneosae, angustae, subulato-spinosae, lucide virides, arcuato-recurvae spinis 1–2 mm. (nec 12 mm.) longis, intimae erectae omnino scariosae, lanceolatae, acute acuminatae, margine integrae haud ciliolatae ; receptaculum convexum setis laevibus contortis. *Flores* albi vel purpurei, involucro longiores. *Filamenta* glabra. *Achaenia* obovato-oblonga, 1–1·5 mm. longa, compressa, subscrobiculato-nigro-maculata, striato-costata, pappi setis brevibus laevibus caducissimis.

Persia. Kelardasht, 1300 m., in steppe and hills, 16 May 1940, *Parsa* 284.

Cousinia (§**Helianthae**) **kandewanensis** *Parsa* sp. nov. valde affinis *C. korowiakowi* Winkler, caule simplici vel bifurcato (nec corymboso-ramoso), foliis utrinque tomentosis (nec supra glabris), involucri phyllis intimis inermibus (nec pungentibus), corollis roseis (nec citrinis), achaeniis 5–6-costatis (nec 3–5-gonis), differt.

Herba perennis, collo rudimentis foliorum densius obtecto stupposo : caulis striatus, 20–25 cm. altus, adpresse albo-tomentosus, simplex vel superne tantum bifurcatus, monocephalus, foliosus. *Folia* carnosula, supra subviridia, subtus copiose argenteo-tomentosa, oblongo-linearia, inferiora 10–15 cm. longa, 1·5–2 cm. lata, longe petiolata, caulina et superiora plus minus longe decurrentia, caulem amplectentia, omnia profunde pinnatipartita, rhachide inaequaliter lobulato-spinosa lobis 2–3-dentatis in spinam flavam pungentem desinentibus, spina terminali sublongiore ; folia summa subintegra, margine sinuato-spinosa. *Capitula* circa 50-flora ; involucrum arachnoideum, phyllis numerosis, intimis chartaceis sensim acuminatis inermibus exteriora superantibus, phyllis exterioribus subcarinatis in spinam luteam acerosam desinentibus, interioribus erectis, mediis erecto-patulis, exterioribus patulis, extimis recurvis. *Receptaculi* setae laevissimae. *Flosculi* rosei, involucri phylla superantes ; corollae tubus limbo inaequaliter quinque-partito paullo longior ; antherarum tubus glaberrimus citrinus ; styli rami exserti. *Achaenia* obpyramidata 5–6-costata inter costas minute striata, apice subdenticulata, pappi setis caducis scabridis.

N. Persia. In the south of Kandewan, 2800 m., 21 July 1938, *Parsa* 275.

var. **golydaghi** *Parsa*, var. nov., planta elatior (30 cm. alta), foliis caulinis petiolatis.

N. Persia. Golydagh, 1000 m., in meadows, 28 June 1938, *Parsa* 285.

Cousinia (§**Brachyacanthae**) **larica** *Parsa* sp. nov. ; affinis *C. involucratae* Boiss. sed humilior (10–13 cm. alta), foliis floralibus capitula haud occultantibus, capitulis pedunculatis (nec sessilibus), 9–15-floris (nec 7–10-floris), involucri phyllis c. 30 (nec 10–12).

Herba perennis, araneoso-tomentosa, caulibus 10–13 cm. altis corymbosis. *Folia* coriacea, subtus albide, supra subviride tomentosa; (radicalia desiderata) caulina lobato-dentata, undulata, dentibus triangularibus in spinam flavam exeuntibus, longiuscule decurrentia, alis plerumque inaequalibus ; folia ramealia eaque ramulorum summorum partim longe cuneato-angustato-alata partim interrupte decurrentia, capitulum terminale haud involucrantia. *Capitula* oblonga subconica, cum flosculis c. 15–18 mm. longa ; involucrum tenuiter araneosum, 10–12 mm. longum, phyllis (c. 30) ab infimis brevissimis ad paenintima sensim et vix elongatis imbricatis valde adpressis, nervo crassiusculo viridi percursis, apice subtriquetro glabro breviter spinoso recurvato-patulis, fere omnibus margine integerrimis, phyllis involucri intimis sublinearibus superne purpureis albo-lanatulis. *Flores* lutei vel rosei tubo antherarum roseo (nec ochroleuci ut in *C. campylacme* Bornm. et Gauba) ; receptaculi setae glabrae. *Achaenia* 2–2·5 mm. longa, costata, obconica, puberula, vix purpureo-maculata, apice undulato-denticulata. N. Persia. Lar valley, 40 miles N.E. of Tehran, in open places in valley, 2100 m., 10 Aug. 1943, *Trott* 814 ; same locality, pink flowers, Jul.–Aug. 1943, *Trott* 892 (type).

This *Cousinia* is also closely allied to *C. campylacme* Bornm. et Gauba, from which it differs by the colour of the flowers, the length of the stem and the leaves not glabrous above.

Cousinia (§**Drepanophora**) **meyameyensis** *Parsa*, sp. nov. a *C. litwinowiana* Bornm. foliis inferioribus decurrentibus, involucri phyllis 50–60 (nec 25–30) longe appendiculatis, achaeniis minoribus laevibus purpureis obpyramidatis differt.

Perennis, e caespite lignoso multiceps ; caules 20–25 cm. alti, teretes, floccosi, albi, flexuosi, foliosi, infra medium subpatule et longe ramosi, paniculam amplam formantes. *Folia* rigida, coriacea, supra viridia subtus parce floccosa, sinuato-lobata, lobis triangularibus in spinam flavam 1·5–3 mm. longam exeuntibus et lateraliter saepe utrinque spinula auctis ; caulina oblongo-oblanceolata, sessilia ; superiora diminuta, remotiuscula, ovato-lanceolata, utrinque 2–3-lobulata, basi late triangularia, amplexicaulia ; summa infra capitula sessilia, anthodium subaequantia et capitula non occultantia. *Capitula* ad apicem ramulorum solitaria vel 2–3-nata, ovato-subcylindrica, 12–15-flora ; anthodium (phyllis exclusis) 5–8 mm. longum ; phylla 50–60, floccosa, basi adpressa, intimis exceptis omnia fere in appendicem producta ; appendix longiusculus anthodii diametro aequilongus, arcuato-recurvus, crassiusculus, ovato-lanceolatus, phyllo toto subaequilongus, 1–1·5 mm. latus, nervo aceroso percursus, rigidulus ; receptaculi setae laevissimae. *Flores* citrini, tubo antherarum purpureo. *Achaenia* 1·5 mm. longa et 0·5 mm. lata, obpyramidata, subcompressa, costata, laevia, apice inaequaliter dentato-coronulata, dentibus margine hyalinis, purpurea.

E. Persia. Khorassan, steppe of Meyamey, 1200 m., 15 Aug. 1936, *Parsa* 137.

Cousinia pugionifera *Jaub. et Spach* var. **decurrens** *Parsa*, var. nov. a typo foliis decurrentibus caulibus alatis floccosis differt.

N. Persia. N. of Teheran, 1200–1800 m, March–April 1936, *Trott* 406.

Cousinia (§**Eucousinia**) **schiraziaca** *Stapf* (*MS in herb. Kew.*) ex *Parsa*, sp. nov. *C. amplissimae* Boiss. affinis sed foliis firmis non mollibus basi breviter cuneatis non rotundatis vel subcordatis sinuato-dentatis non lobato-dentatis, involucri phyllis scabridis vel glabris margine scabridis vel glandulosis non glaberrimis diversa. *C. umbrosa* Bunge planta tenuior et minor est. *C. lappacea* Bunge differt involucri phyllis exterioribus eximie carinatis, corollis majoribus, tubo breviore, achaeniis nigris.

Planta biennis (?), caule elato crasso sulcato remote foliato superne paniculato-ramoso arachnoideo tandem deterso. *Folia* radicalia non visa ; caulina ovato-oblonga, 8–10 cm. longa et 3·5–4 cm. lata, firma, subchartacea, utrinque glabriuscula, viridia, basi breviter cuneata, apice acuminata, sinuato-dentata, dentibus in spinulas tenues abeuntibus, petiolata ; petiolus 1–1·5 cm. longus, canaliculatus ; folia summa valde diminuta, subsessilia, marginibus laevia vel minute et parce spinulosa. *Capitula* parva, ovata, 10–12 mm. usque longa, 4–9-flora, subsessilia, 5–10 in glomerulos secus ramos remotiuscule conferta ; receptaculi setae glabrae ; involucri phylla 55–60 scabrida vel glabra vel glandulosa, nitida, lanceolata, in spinulas elongatas subulatas patule squarrosas apice hamatas abeuntia. *Flores* purpurei. *Achaenia* magna, obovato-oblonga, compressa, obovata, laevia, nigro-maculata.

S. Persia. Bag-i-baj, near Shiraz, 16 Jun. 1885, *Stapf* 2862.

The differential diagnosis at the head of this description is from Dr. Stapf's notes in the Kew herbarium.

Cousinia (§**Orthacanthae**) **turkmenorum** *Bornm. et Gauba*, var. **flaviflora** *Parsa*, var. nov. floribus flavis nec roseis a typo recedit.

W. Persia. Kuhin, 1600 m., 4 Aug. 1936, *Parsa* 201 (type) ; steppe of Abyek (Kaswin), 1400 m., *Parsa* 841.

Crepis elbursensis *Boiss.* var. **breviscapa** *Parsa*, var. nov. pedunculis foliis subbrevioribus distincta.

S. Persia. Shahzade Kuh, 30 June 1941, *Parsa* 297.

Echinops stapfianus *Parsa*, sp. nov. e sectione *Oligolepide* Bunge involucri phylla saltem externa lanigera ; ab affini *E. robusto* Bunge penicillo involucro et involucri phyllis differt.

Caulis simplex (?) adpresse canus, eglandulosus, crebre foliatus. *Folia* subcoriacea, supra viridia (siccitate brunnea) parce arachnoidea, infra albo-tomentosa, elevatim nervosa, amplexicaulia, 12–20 cm. longa, 3–4 cm. lata, ambitu oblongo-lanceolata, in lobos breves longiuscule et validissime 3–5-spinosos fere ad medium pinnatilobata spinis lutescentibus longioribus ad 3 mm. (minoribus circ. 1–2 mm.) longis, area intermedia foliorum 10–20 mm. lata spinulis minutissimis in sinubus segmentorum instructa : folia superiora sensim diminuta, spinoso-lobata, lobis triangularibus spinescentibus. *Glomeruli* brevissime vel ad 5–8 mm. pedunculati, 3–3·5 cm. diametro. *Involucra* 10–13 mm. longa, brunnea, apice alba (siccitate lutea), e foliolis 12–13 composita ; foliola extima 4–5 mm. longa e basi longe attentuata, superne spathulata, albo-marginata, apice albo-villosula, inermi-mucronulata (nec truncata) ; intermedia oblongo-spathulata, cucullato-carinata, superne attenuato-spinosa, serrulata ;

intima in tubum subcoriaceum ultra medium concreta apice fimbriato-lacerata. *Pappus* e setis scabris inaequalibus in coronam basi cohaerentibus compositus. *Penicillus* 5–10 mm. longus, involucrum subaequans setis scabris. *Achaenia* non visa.

S. Persia. Zayandi-Rud (Ispahan), in salt steppe, 29 Sept. 1885, *Stapf*.

Echinops villosissimus *Bunge* var. **glutinosissimus** *Parsa*, var. nov. caulibus patule glanduloso-viscosis, foliis supra viridibus distincta.

S. Persia. Shiraz, 15 June 1885, *Stapf* 1695.

Erigeron elegans *Parsa*, sp. nov. e sectione *Trimorphaea* D.C.

Herba perennis, pumila, usque ad 15–20 cm. alta, pubescens, caule simplice dicephalo. *Folia* inferiora rosulata, oblongo-spathulata, 7–10 cm. longa et 5–7 mm. lata, basi longe et sensim in petiolum attenuata, patule hirsuta, ad apicem abrupte mucronulata ; caulina sessilia lineari-oblanceolata. *Capitula* mediocria involucris villosis, phyllis pilis albis tuberculatis (ut caulinis) lanceolatis acuminatis. *Flores* ligulati, lutei, suberecti. *Pappus* achaenio vix longior. *Achaenia* lineari-obpyramidata, albo-pilosa, recta vel vix curvata.

N. Persia. Pole-zanguleh, rocky places in forest, 2500 m., 21 July, *Parsa* 772.

Erigeron matthiolifolius *Parsa*, sp. nov. e sectione *Trimorphaea* DC. *E. orientali* Boiss. affinis, a quo foliis elongatis mucronulatis ad basin attenuatis vel sessilibus, pilis glandulosis, ligulis roseo-violaceis differt.

Perennis, caulibus ex eodem caudice 55–60 cm. altis erectis sulcatis ad apicem furcatis vel parce ramosis. *Folia* basalia nulla, caulina 6–7 longissima, infima 14–16 cm. longa et 4–5 mm. lata, oblanceolata, a basi longe attenuata, supra ad nervos infra ubique albo-villosa, marginibus integris albo-pilosis, cetera sensim diminuta (superiora valde minora 1–2 cm. longa et 1·5–2 mm. lata lineari-lanceolata). *Involucri* phylla numerosa, erecta, lanceolata, longe acuminata. *Indumentum* caulium et foliorum e pilis albis simplicibus mollibus subcrispulis glanduliferisque paucis intermixtis ; involucri phyllorum e pilis magnis albis appressis caulinis subaequalibus glanduliferisque numerosis ; caules et involucra dense et breviter villosa. *Capitula* media. *Flores* ligulati, numerosi, ligulis 5–7 mm. longis.

S. Persia. Elika, 2600 m., 3 July 1941, *Parsa* 301.

Erigeron sanguineus *Parsa*, sp. nov. e sectione *Trimorphaea* DC., *E. orientali* Boiss. affinis, indumento molliter villoso, foliis caulinis obtusis (nec acutis), ligulis luteis (nec rubellis) distinguitur.

Perennis : caules sanguinei, 60–70 cm. alti, glabri vel glabriusculi, ad medium ramosi, ramis 10–12, 8–15 cm. longis racemum corymbiformem simplicem vel ad apicem compositum formantibus. *Folia* basalia spathulata, obtusa, vix 4 cm. longa, 5 mm. lata, a basi in petiolum 1 cm. longum sensim attenuata ; cetera sessilia. *Involucri* phylla numerosa molliter villosa vel albo-tomentosa, erecta, angustissime lineari-lanceolata, 4–5 mm. longa. *Indumentum* caulium e pilis simplicibus mollibus albis

patento-appressis, foliorum e pilis parvis sparsissimis, foliis marginibus sinuato-denticulatis et faciebus parce et breviter villosis. *Capitula* parva vel mediocra. *Flores* ligulati numerosi, ligulis 4–5 mm. longis.

S. Persia. Parabedin, north of Bandar Abbas, 900 m , 27 March 1940, *Parsa* 88, 253, 254.

Lactuca picridiformis *Boiss.* var. **hirsuta** *Parsa*, var. nov. a typo caulibus ad medios usque et foliis patente glanduloso-hirsutis recedit.

S. Persia. Dasht Nazir, 1000 m., 29 June 1941, *Parsa* 207.

Phagnalon kotschyi *Sch. Bip.* var. **variabilis** *Parsa*, var. nov. foliis oblongo-ellipticis oblanceolatis vel lanceolatis, omnibus albo-pilosis, longe mucronatis, superioribus sessilibus.

S. Persia. Parabedine, north of Bandar Abbas, 900 m., 27 March 1940, *Parsa* 252 p.p.

Phagnalon rupestre L. var. **terminalis** *Parsa*, var. nov. pedunculis terminalibus, involucri phyllis albo-hirsutis acuminatis.

S. Persia. Parabedine, north of Bandar Abbas, 900 m., 27 March 1940, *Parsa* 252 p.p.

Campanulaceae.

Campanula betulifolia *C. Koch* var. **glaberrima** *Parsa*, var. nov. corolla glabra insignis.

N.W. Persia. Azerbaijan, Mount Sabalan, 2500 m., 8 July 1941, *Parsa*.

Campanula triangularis *Parsa*, sp. nov., ex affinitate *C. michauxioidis* Boiss. a qua laciniis calycinis triangularibus velutinis (nec subulato-lanceolatis glabris) tubo longioribus (nec duplo brevioribus) distincta.

Herba parcissime puberula, rhizomate crassissimo repente caudiculos subterraneos emittente, caulibus crassis elatis 40–60 cm. altis foliosis vix paniculatis. *Folia* grosse et acute dentata, inferiora ovato-cordata, longe petiolata, superiora diminuta breviter petiolata vel subsessilia, cuneato-oblonga sensim acuminata, omnia velutino-canescentia. *Flores* secus ramos longos remote dispositi, omnes solitarii, bractea ovata foliacea suffulti, cernui. *Calycis* laciniae triangulares, velutini, tubo subaequales vel longiores. *Corolla* pallide caerulea (in sicco flavida), obconica, ad vel ultra medium in lacinias acutiusculas vel acutas demum reflexas partita. *Stylus* flavidus, corollam aequans.

N.W. Persia. Azerbaijan, Hassanbaglu, 1500 m., 19 June 1941, *Parsa* 875.

Campanula tridentata *Schreb.* var. **velutina** *Parsa*, var. nov. foliis abbreviatis anguste lineari-subspathulatis, caulibus brevissimis, corolla velutina a typo differt.

N. Persia. Disch-Gaduk (North of Firouz Kuh), 1800 m., 18 June 1941, *Parsa* 102.

PRIMULACEAE.

Primula capitellata *Boiss.* forma **nana** *Parsa*, f. nov., scapo brevi, petalis plerumque bifurcatis.

S.E. PERSIA. Kerman ; in regione alpina montis Kuh Lalesar, 3600 m. 16 July 1892, *Bornmuller* 3863 (type) ; Kuh Lalesar 3000 m. meadows and streambanks, 15 May 1932, *Giuseppi* 58.

P. capitellata *Boiss.* forma **alba** *Parsa*, f. nov. petalis albis, calycis dentibus apice atro-violaceis.

S.E. PERSIA. Kerman, in regione alpina montis Kuh Lalesar, 3700 m., 15 July 1892, *Bornmuller* 3862.

P. capitellata *Boiss.* var. **elongata** *Parsa*, var. nov., scapo elongato, petalis dentatis.

S.E. PERSIA. Kerman, Kuh Lalesar, 2100 m., 15 May 1932, *Giuseppi* 58 bis.

PLUMBAGINACEAE.

Acantholimon purpureum *Parsa*, sp. nov. e sectione *Staticopside* Bunge ser. *Microcalycinarum* Bunge. Planta prius ad *A. yamense* Turrill et *A. acerosum* Willd. adducta, sed foliis glabris, inflorescentia foliis aequilonga, bracteis exterioribus hyalinis diversa.

Suffrutex perennis, caespitosus, flexuosus, ramis numerosis humilibus brunneis. *Folia* glauca, conferta, horrida ; vernalia brevissima, reflexa, linearia, acicularia, 4–5 mm. longa et 0.5 mm. lata, subtus convexa glabra subpruinosa, supra plana, ad basin latiora ; aestivalia longiora erecto-patentia, imbricato-rosulata, 4–10 mm. longa et 0.5 mm. lata, flavido-acerosa, medium usque pilosa, ad basin hyalino-marginata, subtus covexa, supra plano-convexa, margine obtusiuscula pilosa. *Scapi* nulli ; spiculae 1–2-florae. *Bractea* exterior ovato-oblonga, utrinque attenuata, subviridis, 3·5 mm. longa, basi 1·5 mm. lata, glabra, hyalino-marginata, apice mucronata, basi pubescente concava ; bracteae interiores 2, nervo excepto hyalinae, secus nervum tantum pallide purpureum, subovato-oblongae, acuminatae. *Calyx* tubo supra glabro 4–5 mm. longo, limbo infundibuliformi, pallide roseus vel purpureus, nervis atro-purpureis. *Corolla* pallide rosea, breviter exserta.

N. PERSIA. Elburz ; summit of Kandewan Pass and in slopes of Taleghan valley, 2400–3000 m., July 1933, *Trott* 33 (type).

W. PERSIA. Arak, Tafresh, Teraran, Mt. Doberaran, 2750 m., *Parsa* (Mus. Nat. Hist. Tehran).

In general aspect this plant looks very like *Acantholimon yamense* Turrill (Kew Bull. 1930, 442) but the diagnosis shows that it is markedly distinct, and, since it does not fit the description of any other species, it has had to be described as new.

GENTIANACEAE.

Gentiana verna *L.* var. **pallida** *Parsa*, var. nov. corollis pallide caeruleis, calycis angulis in alas angustas productis, foliis obtusis distincta.
S. PERSIA. Shahzade Kuh, in fields, 3100 m., 30 June 1941, *Parsa* 310.

BORAGINACEAE.

Anchusa aggregata *Lehm.* var. **pedunculata** *Parsa*, var. nov. ; perennis (?) floribus pedunculatis axillaribus et terminalibus (nec racemis terminalibus densissimis corymboso-capituliformibus floribus subsessilibus), calycis laciniis lineari-lanceolatis (nec triangulari-lanceolatis).

N. PERSIA. In valle fluvii Sefidrud in declivitatibus montium prope Rudbar, 300 m., 6 May 1902, *Bornmuller* 7685 b (sub *A. orientali*).

Arnebia cornuta *Ledeb.* forma **grandiflora** *Parsa*, f. nov. foliis et floribus majusculis distincta.

S. PERSIA. Fars, in arenosis ad Bushire, 4 Mar. 1893, *Bornmuller* 528.

Arnebia cyrousiana *Parsa*, sp. nov., ab *A. cornuta* Ledeb. differt habitu perenni, caule alto simplice, corolla maculata, nuculis obtusis nec acutis.

Perennis, caule elato (tota planta 23–30 cm. alta) simplice, inflorescentia terminali pauciflora. *Radix* verticalis, fusca. *Caulis* erectus, simplex, patule et longe hirsutissimis. *Folia* ligulato-lanceolata, obtusa, longitudine varia, 2·5–15 cm. longa et 3·5–14 mm. lata, superiora diminuta, omnia superne densissime hirsuta inferne sparse pilosa, pilis patulis nudis et tuberculosis intermixtis, rosularia basi longe attenuata, inferiora sessilia, superiora a basi subcordato semiamplexicaulia. *Inflorescentiae* 3–5 cm. longae, 10–12-florae, simplices. *Bracteae* filiformes, floribus subaequilongae, utrinque setis adpressis albis obsitae. *Calycis laciniae* lineares, 5–8 mm. longae, obtusae, albo-setosae, fructiferae vix accrescentes. *Corolla* flava, tubo 10–12 mm. longo breviter et patule hirtulo, limbo amplo 8–12 mm. diametro basi inter lobos maculis 4–5 aurantiacis punctato, lobis suborbicularibus margine albo-hirtulis. *Stigma* atropurpureum, plerumque bifidum. *Nuculae* magnae, subtriquetrae, obtusae, ovatae, dimidio superiore tuberculatae.

N. PERSIA. Kojur, Namazgah, 3100 m., 1 Aug. 1941, *Parsa* 213 (type), 288.

Echinospermum sinaicum *DC.* var. **flaviflorum** *Parsa*, var. nov., a typo foliis spathulatis, floribus flavis distinguenda.

S. PERSIA. Shahzade Kuh, near Shiraz, 3100 m., 30 June 1941, *Parsa* 339 (type).

AFGHANISTAN. Mount Sika-ram, Hariab district, 3000 m., 12 June 1880, *Aitchison* 107.

Heliotropium laricum *Parsa* sp. nov. *H. mamamensi* Bunge valde affinis (et forsan eius varietas), differt indumento tomentoso, corollae tubo limbo multo longiore (nec subaequilongo), antheris supra mediam corollam (nec basin versus) insertis, stylo nullo (nec brevissimo).

Herba annua (?), albo-tomentosa, caule a basi vix ramoso, 40–45 cm. alta. *Folia* breviter petiolata, ovata apice sensim vel abrupte attenuata, obtusa, copiose albo-tomentosa, superne lineis percursa, inferne nervis prominentibus. *Inflorescentiae* geminatae, scorpioideae, 3–5 cm. longae, multiflorae. *Flores* sessiles, albo-tomentosi, parvi, 5 mm. longi. *Calyx* albo-villosus, laciniis lineari-lanceolatis obtusis. *Corolla* tubo infundibuliformi extra adpresse hirto calyce sesquilongiore, limbo in lobos

orbiculares obtusos aestivatione convolutos apice subreflexos partito. *Antherae* supra mediam corollam insertae, lineares, sensim et obtuse brunneo-apiculatae. *Stylus* nullo ; stigma longe conico-attenuatum, hispidulum. *Ovarium* hispidulum.

S. Persia. Fars, Lar, near Bandar Abbas, 1000 m., 14 April 1939, *Parsa* 355.

Heliotropium persicum *Lam.* forma **erosulum** *Parsa*, f. nov., foliis lanceolatis margine erosulo-runcinato distincta.

S. Persia. Fars, in segetibus ad Bushire, 12 Mar. 1893, *Bornmuller* 532.

Onosma (Heterotricha) aurantiacum *Parsa*, sp. nov. ab *O. kilouyensi* Boiss. et Hausskn. caulibus pumilis foliosis (nec subaphyllis), foliis obtusis (nec acutis), calycis laciniis linearibus obtusis, corolla aurantiaca (nec purpurea) distincta.

Perennis, tota planta 10–20 cm. alta, caulibus paucis subsimplicibus. *Rhizoma* verticale, ramulos steriles foliosos et caules floriferos gerens. *Caules* patule setulosi. *Folia* radicalia linearia vel lineari-lanceolata vel oblanceolata, longiuscule et sensim attenuata, 2–2·5 cm. longa et 3–4 mm. lata ; caulina ovato-lanceolata vel oblonga, 2 cm. longa et 2–2·5 mm. lata, sessilia vel semi-amplexicaulia, omnia uninervia (nervis albis), margine alba revoluta, setis patulis e tuberculis ortis hirsuta sed haud stellatim pilosa, inter setas breviter pilosa. *Bracteae* lineares 4–6 mm. longae, 0·5 mm. latae, utrinque hirsutissimae. *Pedicelli* 4–6 mm. longi, setis longis albis obsiti. *Calyx* magnus, quinquepartitus, laciniis linearibus 5–9 mm. longis utrinque setis longis albis obsitis. *Corolla* calyci subaequilonga vel tertia parte longior, puberula, lobis brevissimis obtusis ovato-triangularibus, roseo-aurantiaca. *Nectarium* glabrum. *Antherae* filamentis duplo longiores, apice subinclusae. *Stylus* inclusus.
S. Persia. Shiraz, Kuh Bul, 6 Sept. 1885, *Stapf*.

Onosma (Asterotricha-Perennia) iranicum *Parsa*, sp. nov. inter omnes affines subnotabilis corollis parvis, calycibus (21 mm. tantum longis) sublongioribus, laciniis calycinis angustissimis, corolla glabra, racemis terminalibus haud scorpioideis paucifloris.

Herba perennis, rhizomate adscendente, multiceps, ramulos et caules foliosos c. 35 cm. altos gerens ; caules lignescentes, crassiusculi, dense foliati, in racemos longe pedunculatos producti, undique adpressissime setulosi. *Folia* radicalia petiolo incluso 8–9 cm. longa, lamina obovato-oblonga acuta 3–5 cm. longa et 1–1·3 cm. lata in petiolum longiusculum sensim attenuata ; folia caulina 10–15, parva, 3·5 cm. longa et 1 cm. lata, sessilia, obovato-oblonga, acuta ; folia omnia uninervia adpresse subtuberculato-setosa, setis tenuibus breviusculisque sed rigidulis et regulariter et remotiuscule ordinatis, pagina inferiore et superiore inter setulas minute pilosula. *Racemi* terminales, pauciflori. *Bracteae* obovatae (aliae lanceolatae), acutae, lamina et margine setosae. *Pedicelli* erecti, longiuscule pilosissimi. *Calyx* viridis, magnus, fere ad basin in lacinias lineares angustissimas 5-partitus (3 ad basin partitas 2 bifidas tantum) ; laciniae 2–2·2 cm. longae et 1·2 mm. latae inter se subaequales undique dense albo-pilosae setis tenuibus patentibus. *Corolla* glabra, calyci

subaequalis, flavida, dentibus rectis acutis triangularibus. *Antherae* inclusae, sagittatae, apice summo bifidae, filamentis brevissimis.

W. Persia. Arak, Tafresh, Mt. Doberaran, 2750 m., 10 June 1940, *Parsa*.

Onosma kotschyi *Boiss.* var. **schirazianum** *Parsa*, var. nov. caulibus puberulis.

S. Persia. Kuh Bamu, 3000 m., flowers at first yellow, then blue, 9 July 1885, *Stapf* 2536.

Onosma (**Haplotricha-Perennia**) **oxaliflorum** *Parsa*, sp. nov. *O. kotschyi* Boiss. affinis caulibus pumilis 5–8 cm. (nec 30–45 cm.) altis, foliis subsessilibus vel sessilibus (nec basi attenuatis), corolla caeruleo-violacea (nec albida), calyci subaequali (nec parum longiore) distincta.

Herba perennis, multicaulis, pumila, basi rhizomate indurascente lignosa, ad ramos setis brevibus et ad folia setis longiusculis albis crassis e tuberculo glabro ortis patentibus asperrima, inter setas subglabra ; caules 5–8 cm. alti, tenues, rigidi, subcanescentes, subsimplices vel parce ramosi, in racemum subcapituliformem pauciflorum exeuntes. *Folia* basalia sub anthesi emortua, obovata ; caulina viridia elliptica vel ovato-lanceolata, uninervia, crassiuscula, obtusa, infimis exceptis subsessilia vel sessilia vel semiamplexicaulia, plerumque 1·5–2·5 cm. longa et 5–9 mm. lata. *Racemi* breves, subcapituliformes, 4–6-flori. *Pedicelli* tenues, 3 mm. longi, bractea lanceolata subaequilonga suffulti. *Calyx* ad basin usque in lacinias anguste lineari-lanceolatas fissus, valde albo-setosus, laciniis circiter 3–4 mm. longis et 1 mm. tantum latis acutis. *Corolla* caeruleo-violacea, extra hirtula, cylindrica, calycem subaequans, lobis triangulari-ovatis acutiusculis vel acutis erectis. *Filamenta* elongata, antheris duplo longiora, corolla sublongiora. *Nectarium* hirsutum. *Ovarium* hirsutissimum. *Nuculae* haud visae.

W. Persia. Kurdistan, north of Kasi Shirin, 900 m., on bare rocks, 28 April 1932, *Giuseppi* 4.

Onosma stenosiphon *Boiss.* var. **glabriusculum** *Parsa*, var. nov. corolla glabriuscula vel apice hispidula.

S.E. Persia. Kerman, Kuh Hezar, 1800 m., "flowers yellow, lined down length with red," May 1931, *Balls* 54.

Trichodesma stocksii *Boiss.* var. **linearifolia** *Parsa*, var. nov. foliis viridibus elongatis lineari-lanceolatis longe et sensim acuminatis.

S.E. Persia. Kerman, in regione inferiore montis Kuh Lalesar prope pagum Lalesar, 3000 m., 12 July 1892, *Bornmuller* 3916.

Convolvulaceae.

Convolvulus spinosus *Burm.* var. **subinermis** *Parsa* var. nov., foliis sessilibus spathulatis vel late linearibus, planta minus spinosa distincta.

S.E. Persia. Kerman, in arenosis ad Mahun, 2000 m., 21 May 1892, *Bornmuller* 3886.

Convolvulus turrillianus *Parsa*, sp. nov. in ser. *Perennium* § *Acantho-cladorum* Boiss. (Fl. Or. **4**, 84) ponenda.

Frutex pumilus ubique adpresse argyreus, 17–20 cm. altus, ramis erecto-patulis divaricatis albis patule ramulosis, ramulis brevibus rigidis farinoso-sericeis apice in spinas breves acutatis. *Folia* parva, 8–12 mm. longa et 3–4 mm lata, breviter petiolata, adpresse hirsuta, obovato-elliptica vel elliptica, integra, obtusa, albinervia, superiora angusta. *Flores* parvi in cymas ramulos terminantes dispositi, pedicellis erectis brevissimis suffulti. *Bracteae* ovato-lanceolatae vel lanceolatae, longe flavido-plumosae, 5 mm. longae et 1·5 mm. latae, longe et sensim acuminatae. *Sepala* 14 mm. longa, abrupte acuminata, longe plumosa, subspatulato-squarrosa. *Corolla* lutea, calyce sub-longior. *Ovarium* longe villosum.

S. Persia. Steppe of Karawander, *Parsa* 566.

Convolvulus undulifolius *Parsa*, sp. nov. in ser. *Perennium* § *Inermium* Boiss. (Fl. Or. **4,** 85) ponenda ; a *C. lineato* L. indumento velutino-tomentoso patulo nec adpresso, foliis plus minus undulatis, superioribus ovato-lanceolatis nec linearibus, bracteis late ovatis (nec linearibus) calycem subaequantibus (nec superantibus), floribus longe pedicellatis differt.

Perennis, patule et molliter tomentosa-velutinus, 20–30 cm. altus, caulibus subinduratis vix ascendentibus simplicibus pumilis. *Folia* oblonga, inferiora vel omnia ± undulata, inferiora in petiolum ± longe attenuata, superiora ovato-lanceolata. *Cymae* ad ramulorum apicem 3- vel 2-1-florae, bilaterales terminalesque, bracteis late ovatis abrupte acuminatis calycem subaequantibus. *Flores* longe pedicellati. *Sepala* ovata, abrupte acuminata. *Corolla* rosea, calyce triplo longior. *Ovarium* villosum.

S. Persia. Tiss, Bandar-Abbas, Jan. 1940, *Parsa* 564.

var. **secundus** *Parsa*, var. nov. foliis rosulatis linearibus magis undulatis, caulinis ovato-orbiculatis vel ellipticis sessilibus, racemis floribus sessilibus secundis differt.

S. Persia. Tiss, Charbar, Jan. 1940, *Parsa* 565.

Convolvulus zargarianus *Parsa*, sp. nov. in ser. *Perennium* § *Diffusorum* Boiss. (Fl. Or. **4,** 84) ponenda ; *C. glomerato* Choisy affinis, sed foliis glabriusculis nec adpresse hirtis, inferioribus lanceolatis nec ovatis, ceteris oblongis mucronatis nec acutis, bracteis calyci aequalibus nec longioribus, sepalis oblongo-ovatis nec oblongis, corolla pilosa nec glabra differt.

Perennis, caulibus e radice verticali prostratis longissimis simplicibus sulcatis pilis albis tuberculatis patulis longis aliisque minutis adpressis intermixtis vestitis. *Folia* pallide virentia, glabriuscula, brevissime petiolata, obtuse cordato-hastata, inferiora lanceolata, cetera oblonga mucronata. *Capitula* globosa pedunculis axillaribus 1·5–3 cm. longis foliis longioribus suffulta, longe et laxe racemosa, bracteis foliaceis acuminatis calycem subaequantibus. *Sepala* villosissima obovata longe acuminata. *Corolla* lutea (in sicco), pilosa, calycem superans.

S. Persia. Tiss, Bandar Abbas, 100 m., 2 May 1939, *Parsa* 568.

SOLANACEAE.

Hyoscyamus malekianus *Parsa*, sp. nov. foliorum forma, calycis lobis delicatulis triangularibus insignis.

Perennis, e basi unicaulis, caule pumilo 5–10 cm. alto gracili tenui pilis albis patentibus papilloso-hirsuto. *Folia* 10–20 mm. longa et 8–15 mm. lata, breviter petiolata, petiolis 4–8 mm. longis albo-hirsutis ; lamina ovato-triangularis, basi subcordata, inaequilateraliter et grosse inciso-dentata, utrinque molliter et breviter albo-velutina. *Flores* solitarii, axillares terminalesque, longe pedunculati, pedunculis 5–10 mm. longis patente papilloso-villosis. *Calyx* cupularis, tenuis, ultra medium quinquelobatus, lobis triangularibus sensim acuminatis ciliatis. *Corolla* albo-violacea, basi breviter cylindrica deinde in faucem cupularem latum ampliata, lobis obovatis lineis violaceis 2–3 percursis. *Antherae* exsertae. S.E. PERSIA. Mount Taftan, 2200 m., 9 May 1939, *Parsa* 582.

A very distinct species representing an isolated type characterised by the shape of the leaves, the delicate triangular calyx-lobes and violet corolla.

Hyoscyamus muticus *L.* forma **ovatifolium** *Parsa*, nov. foliis caulinis praesertim breviter rhombeis obtusis (nec oblongo-rhombeis obtusis) differt.

S. PERSIA. Rocks of Tangi-Jiss, 3 May 1885, *Stapf*.

SCROPHULARIACEAE

Celsia elegans *Parsa*, sp. nov. elegans, facie *C. disjectae* Murbeck, a qua distincta videtur caulibus vix ramosis (nec ramosissimis), foliis basalibus lyratis (nec obovatis), bracteis pedicellorum fructiferorum triangularibus acuminatis (nec cordato-triangularibus obtusis vel brevissime mucronulatis), calycis laciniis ovato-lanceolatis (nec obovato-oblongis).

Planta biennis (vel perennis ?), 50–55 cm. alta usque, infra mediam vix ramosa, ramis subpatulis apice haud spinescentibus. *Caulis* erectus, teres, substriatus, praeter partem inferiorem paucifoliatus, sicut etiam rami per totam longitudinem et praecipue inferne glandulis albis sessilibus verruculiformibus plus minusve dense obsitus. *Folia* basalia etiam post anthesin lyrato-pinnatisecta, rosulata, omnia parce verrucosa, utrinque pilis simplicibus molliter crispato-albo-villosa ; petiolus 5–10 mm. longus, sat angustus ; segmenta lateralia numerosa, parva, valde inaequalia, alia minuta subsessilia subserrata vel dentata, alia usque ad 5 mm. longa sessilia ovata crenato-dentata ; segmentum terminale multoties majus a basi subcordato- vel truncato-cuneato inaequaliter crenato-dentatum vel duplicato-crenatum ; folia basalia usque 14 cm. longa ; caulina inferiora valde diminuta, lyrato-pinnatisecta, segmentis lateralibus lineari-ellipticis 2·5 mm. longis et 0·5 mm. latis, valde pubescentia ; caulina submedia, oblanceolata, sessilia, margine dentata. *Racemi* laxi, terminales, multiflori, denique ± elongati ; rhachis per totam longitudinem parce glandulis albis verruculiformibus obsita. *Bracteae* pedicellis fructiferis multo brevior, triangulares, sensim acuminatae, integerrimae, basi verrucoso-glandulosae. *Pedicelli* fructiferi 7–22 mm. longi, tenues sed demum rigiduli, patuli vel erecto-patuli, dimidio superiore glandulis verruculiformibus obsiti. *Calycis*

laciniae 1·5–2 mm. longae, ovato-lanceolatae, abrupte acuminatae, integerrimae, glandulis paucis subsessilibus obsitae, apice violaceae. *Corolla* lutea 1·5–1·8 cm. diametro, extra intusque parce glandulosa. *Stamina* 4 ; filamentum anticum 3–4 mm. longum, postica parum longiora et vix crassiora, omnia ad apicem usque papillis longis violaceis clavatis sat dense villosa ; antherae omnes reniformes, medifixae, antica posticis parum major. *Stylus* 5–6 mm. longus, glaber vel vix verruculosus, apice clavato-capitatus. *Ovarium* glandulis subsessilibus instructum.
S. Persia. Laristan, on rocky limestone slopes, Djahrum village, Mansourabad, 1000–1100 m., 13 April 1939, *Parsa* s.n.

In Murbeck's classification of the genus (Monogr. Celsia, 57 : 1925) *C. elegans* is to be placed in Sect. *Bothrospermae*, subsect. *Nefflea*, grex II *Holotrichae*. In general facies it resembles *C. melhanensis* Murbeck.

Linaria (**Linariastrum**) **zargariana** *Parsa*, sp. nov. facie *L. genistifoliae* L. et ei affinis sed differt foliis mucronatis (nec acutis), racemis densis (nec laxiusculis), calycis laciniis ovato-lanceolatis vel triangularibus obtusis (nec lanceolatis acutis) corollae tubo vix brevioribus (nec aequalibus), capsula calycem aequante (nec subbreviore).

Herba annua, glabra, radice simplice verticali tenui, caule elongato 40 cm. alto crassiusculo glabro viridi a basi ad apicem dense foliato. *Folia* ovato-lanceolata, mucronata, sessilia vel semiamplexicaulia, 1·5–2·5 cm. longa et 3–6 mm. lata, crassiuscula, viridia, utrinque concoloria, nervis obscuris vel tribus plus minusve prominulis percursa, utrinque glabra, superiora sensim diminuta. *Racemi* densi, elongati, 10–15 cm. longi. *Pedicelli* stricti, calycem et bracteam subaequantes. *Flores* mediocri. *Calyx* usque ad basin fissus, laciniis ovato-lanceolatis triangularibus vel ellipticis obtusis albo- et ciliato-marginatis 3 mm. longis et 1 mm. latis, corollae tubo vix brevior. *Corolla* lutea, concolor, calcare excluso 7–8 mm. tantum longa, calcare corollam subaequante rectiusculo. *Capsula* globosa vel ovata, glabra, stylo longiore apiculata.

N. Persia. Meshkambar, 1500 m., in graminosis, 15 June 1941, *Parsa* 861.

Pedicularis condensata *M. Bieb.* var. **pinnatipartita** *Parsa*, var. nov. foliis profunde bracteis minus pinnatipartitis (nec foliis pinnatisectis bracteis dentatis), galea obsolete dentata a typo differt.

W. Persia. Borujerd, June 1940, *Parsa*.

Pedicularis mobayenii *Parsa*, sp. nov. e sect. *Erostrium* Boiss. (Fl. Or. **4,** 483) *P. pycnanthae* Boiss. affinis foliis pinnatipartitis, bracteis pinnatipartitis vel dentatis (nec integris), corolla lutea (nec pallide carnea) distincta.

Perennis, siccitate nigricans, ± crispule albo-lanatula, caulibus pumilis cum inflorescentia 10–12 cm. longis singulis vel binis rarius pluribus adscendentibus foliatis. *Folia* radicalia numerosa, ambitu oblongo-lanceolata, petiolo laminae aequilongo vel breviore suffulta, petiolo excluso 3–5 cm. longa et 6–7 mm. lata, profunde pinnatipartita, laciniis ovato-lanceolatis vel triangularibus margine acute et inaequaliter et ± profunde dentatis ; folia caulina diminuta, pauca. *Spica* densiflora,

ovata, condensata, subcapitata, bracteis late linearibus obtusis 3–6 mm. longis et 1·5–3 mm. latis calycem aequantibus vel sublongioribus albo-lanatis dentatis. *Flores* sessiles. *Calyx* albo-lanatus, campanulato-tubulosus, cum dentibus 7–8 mm. longus et 3 mm. latus, ad tertiam partem in dentes lineari-oblongos valde inaequales integros fissus. *Corolla* siccitate lutea, 10–14 mm. longa, leviter arcuata, calyce subduplo longiore ; galea labium inferius superans, apice subbilobata ; labii inferioris lobi rotundati. *Filamenta* superne glabra ; antherae biauriculatae, inclusae.

S. Persia. Shahzade Kuh, on stream-bank, associated with *Trifolium rytidosemium* Boiss. et Hohen., 30 June 1940, *Parsa* 300.

Scrophularia hajariana *Parsa* (sect. *Tomiophyllum* Benth. ser. *Oppositifoliae* Boiss.), sp. nov. *S. pulverulentae* Boiss. et Noë affinis, foliis magnis acute (nec obtusiuscule) dentatis, cymis 1–3-floris (nec 3–7-floris), calyce hirtulo (nec glabro), capsula subrostrata (nec acuta).

Perennis elata, simplex, undique papillis albis minimis plus minusve crebris glutinosis ; caules c. 30 cm. longi praeter apice parce ramosi, simplices, tenues, saepius nigricanti-rubelli, opaci, inferne foliosi, in racemum elongatum 8–12 cm. longum inferne compositum laxiusculum exeuntes. *Folia* ovata, sessilia, 5–6 cm. longa, 3–3·5 cm. lata, argute dentata, apice acuta, utrinque villosula, viridia supra, siccitate atra. *Inflorescentia* subaphylla ; bracteae bracteolaeque lineari-lanceolatae, minimae, circiter 3 mm. longae et 1 mm. latae, obtusae, glutinosae ; cymae 2–3-florae, glandulosae, pedicellis calycem aequantibus vel subbrevioribus. *Calycis* lobi eglandulosi, orbiculati, circiter 3 mm. longi et lati (statu frutescente), late eroso-hyalini. *Corolla* lutea ? *Capsula* ovoidea, 1 cm. longa, apice sensim attenuata, subrostrata, brunnea.

N. Persia. Namazgah of Kojur, 3000 m., 1 Jul. 1941, *Parsa* 296.

Scrophularia olympica *Boiss.* var. **multiflora** *Parsa*, var. nov. cymis haud unifloris, floribus omnibus pedicellatis distincta.

N. Persia. Kalak Mt. near Tehran, 1500 m., 7 May 1936, *Parsa* 8.

Scrophularia pinardi *Boiss.* var. **acutiloba** *Parsa*, var. nov., folii segmentis acute lobatis, foliis supremis similibus.

N. Persia. Namazgah, 3100 m., 2 July 1941, *Parsa* 529.

Verbascum aspina *Parsa*, sp. nov. *V. pentelico* Murb. affine, a quo bracteis longe (nec breviter) acuminatis infimis glomerulis duplo-vel triplo-longioribus (nec subaequalibus), calyce 3–4 mm. (nec 9–12 mm.) longo, corolla 4–6 mm. (nec 22–28 mm.) diametro haud creberrime pellucido-punctata, molliter pilosa glabrescente (nec floccoso-tomentosa), antheris sagittatis (nec reniformibus), ovario ellipsoideo (nec subgloboso) differt.

Planta perennis vel biennis, elatus. *Caulis* erectus, foliosus, griseo-tomentosus, cortice atrorubescente vel atroviridi, superne rami paucis suberectis praeditus. *Folia* omnia supra viridia, parce et minute stellato-hirtula, subtus tomento brevi griseo-canescente dense vestita ; basalia haud visa ; caulina ovato-lanceolata vel lanceolata, crenata, acutiuscula,

inferiora petiolata, superiora sessilia vel amplexicaulia, a basi cordata. *Glomeruli* 2–5-flori, sat distincti ; infimi ± remoti. *Bracteae* magnae, longe acuminatae supra virides glandulis paucis albis stipitatis obsitae, subtus dense molliterque albo-tomentosae, infimae foliaceae, triangulari-ovatae glomerulos duplo vel triplo superantes ; ceterae ovato-lanceolatae, glomerulos subsuperantes, ultimae glomerulos subaequantes. *Flores* glomerulorum primarii pedicello 2–4 mm. longo praediti. *Calyx* 3–4 mm. longus, molliter lanato-tomentosus, ad medium quinquepartitus ; laciniae anguste lineares, apice obtusae, extra pilis ramosis floccoso-tomentosae. *Corolla* lutea, 4–6 mm. diametro, extra tenuiter pilosa haud manifeste pellucido-punctata. *Filamenta* omnia per totam longitudinem papillis longissimis albidis superioribus apice clavatis dense villoso-velutina. *Antherae* sagittatae, medifixae. *Ovarium* ellipsoideum, dense tomentellum.

N. Persia. Talesh (littoral of Caspian Sea), Aspina, 1600 m., 27 July 1941, *Parsa* 778.

Verbascum aurantiacum *Parsa*, sp. nov. *V. georgico* Benth. affine a quo ob folia subtus parce floccosa supra glabriuscula (nec tomentosa) majora crenata (nec obsolete crenato-denticulata) superiora amplexicaulia, ob bracteas acuminatas floribus breviores (nec aequalia vel paullo longiores), ob calycem 2–3 mm. (nec 6–7 mm.) longum, lobis ellipticis obtusis (nec lanceolatis-acutis), et ob corollam pellucido-punctatam differt.

Planta perennis vel biennis, sesquipedalis, pilis ramosis et simplicibus eglandulosis et glanduligeris albo- vel subflavescenti-tomentosa. *Caulis* stricte erectus, elatus, foliatus, velutino-floccoso-tomentosus, in paniculam densam 40 cm. longam abiens. *Folia* utrinque subviridia, omnia subtus parce floccosa, supra glabriuscula ; basalia et caulina infima petiolo crasso 2–5 cm. longo praedita, lamina 25–30 cm. longa et 9–10 cm. lata crenata elliptico-lanceolata ; caulina petiolis alatis ; superiora abrupte diminuta, amplexicaulia, elliptico-lanceolata, acuta vel acutiuscula, obscure crenata. *Flores* solitarii, pedicello 2–4 mm. longo praediti. *Bracteae* carnosulae, subtus dense flavido-tomentosae (pilis glanduligeris), supra glabrae, abrupte acuminatae, pedicello subaequales vel paullo breviores, omnes ovatae. *Calyx* 2–3 mm. longus, extra dense flavido-glanduloso-tomentosus, fere usque ad medium in lacinias ellipticas obtusas divisus. *Corolla* aurantiaco-purpurea 1·5–2 cm. diam., pellucido-punctata, extra albo-villosa. *Filamenta* aurantiaca omnia inter se libera vel basi subconnata, 2 antica circiter 3 mm. longa parte superiore subunilateraliter longe papillosa ; antherae minimae. *Stylus* circiter 4 mm. longus, apice sub stigmate longe papillosus, ceterum glaber. *Ovarium* tomentosum.

N.W. Persia. Azerbaijan, Kalibar, 1200 m., 26 June 1944, *Parsa* 44.

Verbascum ellipticifolium *Parsa*, sp. nov. *V. discolori* Murbeck affinis sed tota planta breviter floccosa, foliis caulinis inferioribus subsessilibus (nec plus minus longe petiolatis), mediis decurrentibus (nec breviter petiolatis), bracteis pedicellis fructiferis duplo longioribus (nec squamiformibus pedicellis multo brevioribus), calycis dentibus floccosis, laciniis obtusis, corolla extra pilosa, stylo basi tomentoso differt.

Planta perennis vel biennis 80–100 cm. alta, eglandulosa. *Caulis* stricte erectus, teres, striatus, remotiuscule grandifoliatus, albo-floccosus. *Folia* omnia crassiuscula, mollia, utrinque tomentosa ; basalia ampla, 20–25 cm. longa et 5–6 cm. lata, petiolo angusto 5 cm. longo praedita ; lamina 8–10 cm. longa et 5–6 cm. lata, ± late elliptica vel obovato-oblanceolata, apice obtusa, inaequaliter crenato-dentata, basi sensim in petiolum angustata ; caulina inferiora subsessilia, elliptica, ad basin sensim attenuata ; media decurrentia, late elliptica, obtusiuscula ; superiora valde diminuta, ovata, 2 cm. longa et 2–3 cm. lata, amplexicaulia, abrupte cuspidata, dentata. *Glomeruli* inflorescentiae terminalis sat approximati, 1–5-flori, ramis erectis vel ascendentibus paniculam oblongam formantibus. *Bracteae* magnae ovato- vel lanceolato-triangulares, longe et sensim cuspidato-acuminatae, pedicellis fructiferis duplo longiores. *Pedicelli* omnes sub-erecti, dense tomentosi. *Calyx* sub anthesi 2 mm. longus, post anthesin 2·5–3 mm., leproso-floccosus, ad basin in lacinias lineari-lanceolatas obtusas vel obtusiusculas partitus. *Corolla* lutea, 10–14 mm. diametro, pellucide-punctata, extra pilosa, tubo subnullo. *Filamenta* omnia usque ad antheras papillis longis albis apice ± clavatis dense villoso-velutina. *Antherae* omnes subreniformes, medifixae. *Stylus* 3–4 mm. longus, basi floccosus, stigmate punctato. *Capsula* subellipsoidea 2–3 mm. longa, floccoso-tomentosa, obtusa, calycem subaequans.

S. Persia. Kuh-i-Jarub, 1600 m., 4 June 1940, *Parsa.*

This species has the aspect of *V. kotschyi* Boiss. and *V. leptostachyum* DC.

Verbascum firuzabadicum *Parsa*, sp. nov. *V. lasiantho* Boiss. affinis, caule subsimplice, inflorescentia laxe racemosa supra in spicas abeunte, foliis haud auriculatis, corolla aurantiaca vel purpurea differt.

Herba biennis vel perennans, 55–70 cm. alta, omnino tomento denso albo- vel cinereo-lutescente eglanduloso persistente vestita. *Caulis* robustus, rigidus, cavus, teres, remotiuscule foliatus, simplex, floribus in fasciculos axillares racemum elongatum formantes dispositis. *Folia* omnia ob tomentum densum ± crassa, obscure crenata vel subintegra ; basalia petiolo elongato circiter 10 cm. vel ultra longo praedita ; lamina elliptica obtusa 10 cm. vel ultra longa et ad 6–7 cm. lata ; caulina inferiora paulo diminuta vel subaequantia breviter petiolata petiolis 1 cm. longis utrinque attenuata, superiora a basi ovata, sessilia, valde diminuta, 2–2·5 cm. longa et 5 mm. lata, apice longe attenuata, basi haud auriculata. *Fasciculi* multiflori, pedunculati, floribus confertis, omnibus albo- vel cinereo-stellato-tomentosis. *Bracteae* lineari-lanceolatae sensim et longe acuminatae floribus subduplo longiores vel demum subaequales. *Calyx* 2–3 mm. longus, sicut bractea pedicellique dense et subasperule tomentosus, ad 2/3 in lacinias ovato-triangulares acutas haud punctatas sed extra dense apice intusque minus stellato-tomentosas fissus. *Corolla* aurantiaco-purpurea, glabriuscula vel extra paulo stellato-tomentosa.

S. Persia. Firuzabad, mountains near Shiraz, 1800 m., 9 Apr. 1939, *Parsa.*

Verbascum kalibaricum *Parsa*, sp. nov. *V. georgico* Benth. affinis, sed foliorum forma, floribus sessilibus, bracteis ovato-lanceolatis acuminatis (nec linearibus), calyce 3–4 mm. longo (nec 6–7 mm.) fere usque ad

medium vel infra medium (nec ad basin) in lacinias diviso, corolla breviore (3–5 mm. nec 20–25 mm. diametro) intus glabra differt.

Planta biennis (?), elata, pilis crispis albo-cinereis vestita. *Folia* inferiora magna, oblanceolata, 30–35 cm. longa, 8–10 cm. lata, in petiolum brevem alatum sensim attenuata,inaequaliter dentata, utrinque stellatim tomentosa, supra viridia, subtus subcanescentia ; caulina amplexicaulia, diminuta, elliptica vel oblanceolata, sensim et valde acuminata, acumine crenato ; cetera inaequaliter dentata, superiora valde diminuta, ovata nec acuminata. *Flores* post anthesin ± remoti, plerumque solitarii vel raro in axillis bractearum inferiorum binati, subsessiles. *Bracteae* subtus stellato-tomentosae, supra glabrae, floribus aequales vel vix breviores, sub anthesi sursum curvatae, omnes ovato-lanceolatae vel ovatae, acuminatae. *Calyx* 3–4 mm. longus, extra stellatim albo-tomentosus, fere infra medium in lacinias ovato-lanceolatas vel ovato-orbiculatas obtusiusculas divisus. *Corolla* lutea, 5–8 mm. diametro, extra dense stellato-pilosa, intus glabra vel glabriuscula nervis reticulatis. *Stylus* 5 mm. longus, a basi longe tomentellus, stigmate capitato. *Ovarium* dense tomentosum.

N.W. Persia. Azerbaijan, Kalibar (Ahar), 1000 m., 25 May 1941, *Parsa* 45.

This species is to be referred to Sect. *Bothrosperma* subsect. *Singuliflora* Murbeck.

Verbascum phyllostachyum *Boiss. et Hausskn.* var. **integrifolium** *Parsa*, var. nov., foliis paucis integris, caulinis ad basin angustatis (nec cordato-semiamplexicaulibus) obtusis, pedicellis calycem subaequantibus distincta.

N. Persia. Arak (Teraren), 1890–2000 m., 10 June 1940, *Parsa* 625.

Veronica (§**Chamaedrys**) **alliaria** *Parsa*, sp. nov. facie *V. stenobotrydis* Boiss. et Blanche sed foliis intermediis ellipticis (nec subcordatis), pedicellis calyce sublongioribus (nec subaequilongis), calycis laciniis crassiusculis enerviis (nec trinerviis), capsula enervia calyce paullo longiore differt.

Planta perennis velutinus. *Caules* rubri, numerosi, basi sublignosi, foliosi, ascendentes, 15–20 cm. alti inflorescentia inclusa. *Folia* heteromorpha, lineari-elliptica obtusiuscula utrinque attenuata vel oblanceolata integra vel ± dentato-serrata, dentibus triangularibus ascendentibus obtusis lobo terminali multo majore, omnia margine revoluta, crassiuscula, utrinque crispule et densissime villosula. *Racemi* 5–7 cm. longi, rigidi, 2–4 ex axillis foliorum summorum, glanduloso-hirtuli. *Pedicelli* 4–6 mm. longi, bracteis linearibus obtusis subaequales. *Calyx* 1–1·5 mm. longus, subglanduloso-hirtulus, capsula vix brevior vel aequans ; laciniae 4, anguste lineares, obtusae, per paria basi coalitae, enerviae. *Capsula* rubra, hirtula, enervia, 2–2·5 mm. longa et 1·5 mm. lata, obcordata, compressa, dura, calyce vix longior vel aequans.

W. Persia. Mt. Doberaran, 2750 m., Aug. 1939, *Parsa* s.n.

var. **canescens** *Parsa*, var. nov. caulibus elatioribus, foliis longioribus, tota planta canescente differt.

N.W. Persia. Azerbaijan, Ushnu to Mambrahim, 1800 m., 31 May 1929, *Cowan & Darlington* 1438.

Veronica campylopoda *Boiss.* forma **laticalycina** *Parsa*, forma nov. calycis fructiferi laciniis majoribus insignis.

W. Persia. Mt. Doberaran, 2750 m., Aug. 1939, *Parsa* s.n.

Veronica darlingtonii *Parsa* sp. nov. *V. hispidulae* Boiss. et Huet et *V. syriacae* Roem. et Schult. affinis. A *V. syriaca* foliis integris, bracteis pedicellos subaequantibus stylo sinu haud duplo longiore, a *V. hispidula* caule simplice vel subsimplice, stylo sinu vix vel dimidio (nec quadruplo) breviore differt.

Annua pumila, 5–10 cm. alta, superne glanduloso-hirta, inferne minute et sparse albo-hirtula, caule filiformi simplice vel medio ramis oppositis biramoso. *Folia* minuta, inferiora 3–4 mm. longa et 1 mm. lata, basi in petiolum attenuata, integra, obtusa, glabra ; caulina media longiora, 5–10 mm. longa et 2–2·5 mm. lata, utrinque attenuata, sessilia, margine hirtula, unidentata vel integra ; floralia linearia pedicellis subaequalia vel vix breviora. *Racemi* laxiusculi, pedicellis subpatentes sursum recurvis 3–4 mm. longis filiformibus. *Calycis* laciniae 4, 1–1·5 mm. longae, 0·5 mm. latae, per paria basi connatae, margine breviter et molliter hirtula excepta glabrae, capsula vix breviores. *Corolla* caerulea vel alba. *Capsulae* lobi 4 mm. longi et 2 mm. lati, margine patente et sparse hirtula ; stylus filiformis sinu duplo brevior.

N.W. Persia. Azerbaijan, hills above Gilas, 2400 m., 29 May 1929, *Cowan & Darlington* 1332, 1353 (type).

Veronica (§**Alsinebe**) **issaa** *Parsa*, sp. nov. a *V. viscosa* Boiss. pedicellis fructiferis suberectis (nec horizontalibus), laciniis calycinis obtusissimis, capsula hirtula vel glabriuscula (nec glabra) differt.

Annua, siccitate nigrescens, radice tenui verticali pauciramoso, caule valde glanduloso-pubescente erecto vel subpatulo 10–14 cm. longo ramoso. *Folia* ovata vel elliptica, inciso-crenata vel crenata, obtusa, basi in petiolum attenuata, utrinque pilosula, 4–8 mm. longa et 3–6 mm. lata, superiora sensim diminuta. *Racemi* terminales, deniusculi, valde glanduloso-pubescentes, 8 cm. usque longi. *Pedicelli* subpatuli, 4–6 mm. longi, glanduloso-puberuli. *Calycis* laciniae per paria basi connatae, ellipticae, obtusae, valde glanduloso-hirtulae, nervosae, 5 mm. longae et 1·5 mm. latae. *Capsula* erecta, hirtula, 5 mm. longa et 4 mm. lata, parte tertia superiore bilobata, lobis obscure reticulatis obtusis ; stylus sinum aequans vel vix brevior.

N. Persia. Namazgah of Kojur, 3000 m., 1 July 1941, *Parsa*.

Veronica kermanica *Parsa*, sp. nov. *V. arvensi* L. affinis a qua tamen distincta videtur foliis anguste ellipticis integris (nec cordato-ovatis crenatis), racemis haud spiciformibus pedicellis calyce sublongioribus.

Herba annua, siccitate nigricans, tota incano-velutina. *Caules* numerosi dense foliosi, ascendentes vel diffusi vel ad basin prostrati, cum inflorescentia 2–5 cm. alti, albo-pilosuli. *Folia* anguste elliptica vel subspathulata obtusa, 2·5–3 mm. longa, 1–1·5 mm. lata, crassiuscula, utrinque minute et sparse albo-pilosula, margine integra, ad basin sensim in petiolum attenuatum. *Inflorescentia* 1–2 cm. longa, molliter tomentella, racemo denso multifloro. *Bracteae* minutae, lineares, obtusa vel obtusiuscula, sessilia, 0·5—1 mm. longa. *Pedicelli* 2 mm.–2·5 mm. longa, bracteis

duplo longiores. *Calyx* 1·5–2 mm. longa, laciniis 4 linearibus obtusis enerviis albo-hirtulis (pilis minutis sparsis obsitis) per paria basin versus coalitis capsula vix brevioribus vel subaequalibus. *Corolla* purpurea vel (siccitate) rosea, lobis 2 mm. longis et 0·5 mm. latis calyce vix longioribus. *Capsula* 2 mm. longa et 1·5 mm. lata, glabriuscula, compressa, cordata, stylo filiformi 1·5 mm. longo sinum superante.

S.E. Persia. Kerman, in summo monte Kuh-i-Dschupar, 3400–3800 m., 11 Jun. 1892, *Bornmuller* 5004 (type). Shotoron Kuh, 4000 m., 20 Jul. 1888, *Strauss* s.n.

Veronica kurdica *Benth.* var. **longiracemosa** *Parsa*, var. nov. racemis elongatis densiusculis.

N. Persia. Elburz, Touchal, 3000 m., *Parsa*.

Veronica michauxii *Lam.* var. **glabra** *Parsa*, var. nov. tota planta glabra (nec papillis crispulis undique pubescens viscidula), foliis superioribus sessilibus (nec vel vix amplexicaulibus) differt

S.E. Persia. Kerman, Kuh-i-Nasr, in valle Husseinabad, 2500 m., 4 Jul. 1892, *Bornmuller* 5001.

Veronica (§**Alsinebe**) **pseudodivaricata** *Parsa*, sp. nov. *V. divaricatae* Boiss. et Bal. similis sed glabra vel glabriuscula (nec glandulosa), stylo brevissimo sinu superato (nec longissimo sinum superante) differt.

Annua, siccitate nigrescens, caulibus filiformibus brevibus 3–6 cm. longis fragilibus basi saepius ramosis. *Folia* tenera (nec carnosa), subenervia, ovato-elliptica vel lanceolata, basi in petiolum attenuata, 1–1·5 cm. longa et 3–4 mm. lata, sparse et minute albo-hirtula, crenata, obtusa ; floralia valde diminuta, linearia vel spathulata. *Racemi* terminales, pluriflori, laxi. *Pedicelli* filiformes, 5–9 mm. longi, patentes, calyce 2½–3-plo longiores, fructiferi patentes apice sursum curvati. *Calyx* sparse et minute albo-hirtulus, laciniis 4 subinaequalibus obovatis vel ellipticis obtusis fructiferis vix auctis 1–1·5 mm. longis et 0·5 mm. latis. *Corolla* caerulea, calycem subaequans vel vix longior. *Capsula* puberula, in lobos ellipticos apice emarginatos vel subretusos angulo obtuso valde divergentes ad medium vel 3/4 bipartita, stylo minuto sinu superato.

S.E. Persia. Kerman, Kuh-i-Dschupar, 3300 m., 7 May 1897, *Bornmuller* 5023.

Labiatae.

Lamium (**sect. Lamiopsis**) **iranicum** *Parsa*, sp. nov. *L. pontico* Boiss. et Bal. affinis sed foliis basi haud cordatis, calycis lobis latioribus, corolla extra breviter pubescente (nec pilosa) differt.

Herba annua 20–30 cm. alta. *Caules* glaberrimi, tenues, simplices vel basi ramosi. *Folia* viridia ; inferiora glabra vel sparsissime et minute hirtula, ovato-orbicularia, paucicrenata (crenis utrinque 3–5), longe petiolata, apice rotundata, lamina circiter 8 mm. longa et 6 mm. lata, petiolo circiter 2 cm. longo ; superiora majora, circiter 1·5 cm. longa et 1 cm. lata, petiolo breviore 1 cm. usque longo, infra minute hirtula, a basi subcordata vel cuneata, paucidentata ; omnia inter se distantia et,

infimis exceptis, fertilia. *Verticillastra* superiora pauciflora ; flores infimi solitarii. *Calyx* (praecipue florum superiorum) leviter purpurascens, 1 cm. usque longus, sparse et minute hirsutus, laciniis inaequalibus triangularibus in spinulos tenues et breves acuminatis. *Corolla* purpurea (siccitate lutea) duplo vel triplo calycem superans, tubo intus glabro extra sparse hirtulo, galea retusa elliptico-oblonga extra pubescente. *Antherae* albo-hirsutae.

S. Persia. Shiraz, wood at foot of Kuh-i-Bil, 19–20 May 1885, *Stapf* (labelled *Lamium persepolitanum* Bunge).

Marrubium laricum *Parsa*, sp. nov. ex affinitate *M. catariifolii* Desr., sed habitu perenni, caule albo, verticillastris 6–8-floris differt.

Herba perennis, caulibus albo-lanatis ex infima parte ramosis 15–30 cm. altis. *Folia* inferiora et media petiolata, suborbiculata, e basi cuneata, crenata, 10–15 mm. longa et 10–13 mm. lata, subtomentosa, supra viridia, infra albo-canescentia, utrinque reticulato-nervosa ; summa diminuta, subsessilia. *Verticillastra* densiflora, 6–8, inter se distantia. *Bracteae* angustissimae, lineares, copiose villosae, tubo calycino subaequales vel vix longiores. *Calyx* tubo villoso sulcato intus longe piloso 4 mm. longo, dentibus spinescentibus recurvo-stellatis tubo dimidio brevioribus. *Corolla* parva, albida (siccitate lutea), tubo piloso-annulato basi tenui supra medium abrupte ampliato, labio superiore ad tertiam partem bilobato, inferiore trilobo.

N. Persia. Lar (north of Tehran), Gherkbolagh, 3300 m., Aug. 1937, *Parsa* 169

Nepeta betonicifolia *C. A. Mey.* var. **discolor** *Parsa*, var. nov. a typo foliis supra viridibus infra albo-tomentosis, omnibus apice rotundatis (nec superioribus acutiusculis) differt.

N. Persia. Steppes of Dimichal valley, 900 m., 16 Sept. 1939, *Parsa* 749

Nepeta (**Eunepeta**) **lagopsioides** *Parsa*, sp. nov. ex affinitate *N. lagopsidis* Benth., a qua bracteis oblanceolatis spinuloso-mucronatis calycibus mediis aequalibus, calycis dentibus aliis minutis lanceolatis, aliis majoribus obovatis, tubo calycino et corolla brevioribus differt.

Herba perennis, omnino pilis albis vel luteis intertextis molliter vestita, caulibus inferne saepius pilis albis breviter villosis superne dense et crispule albo-villosis pumilis, 10–20 cm. altis, numerosis raro simplicibus, saepissime basi ramis binis vel ternis floriferis auctis foliosis. *Folia* sparsa, infima acutiuscula dentata, caetera profunde rotundato-crenata, omnia (floralibus exceptis) petiolo 2 mm. longo et lamina circiter 4–5 mm. longa et lata ovato-reniformia basi cordata, utrinque albo- et crispulo-villosula. *Verticillastra* densa, sessilia, pilis mollibus lanatis obtecta, in spicam unicam capituliformem vel ovoideo-oblongam terminalem congesta et foliis supremis diminutis obovato-oblanceolatis dentatis apice mucronatis involucrata. *Bracteae* oblanceolatae, apice spinuloso-mucronatae, integrae, calycum dimidio aequales, purpurascentes, utrinque pilis longis albis intertextis villosis. *Calyx* 5–6 mm. longus, violaceus vel purpurascens, ut bracteae albo-villosus, supra medium fissus, dentibus

valde inaequalibus 3 superioribus aequilongis (sed medio latiore) oblanceolatis longe mucronatis, 2 inferioribus lanceolatis paulo elongatis mucronatis tubo vix brevioribus. *Corolla* purpurascens (siccitate lutea), pubescens, 6–6·5 mm. longa, tubo tenui sub fauce ampliato, labio superiore bilobo, inferiore trilobo lobo medio latissimo. *Stamina* vix exserta, antheris atropurpureis.

S. Persia. Shahzad-i-Kuh, 3000 m., 30 June 1941, *Parsa* 302.

Salvia (**Aethiopis**) **alliaria** *Parsa*, sp. nov. ex affinitate *S. macrosiphonis* Benth. a qua foliis floralibus calycibus longioribus, verticillastris 6–2-floris, calycis dentibus triangularibus, corolla alba vel luteo-purpurascente calyce sublongiore tubo vix exserto glabra differt.

Herba perennis, stricta, inferne arachnoideo-villosa ; caules herbacei, cavi, obtuse quadrangulares, circiter 20–30 cm. alti, foliosi, uti planta tota patule hispidi. *Folia* inferiora petiolata, cum petiolo 4–7 cm. longa et 0·5–1·5 cm. lata, anguste elliptica, apice rotundata, margine irregulariter eroso-crenata vel repando-dentata vel lobata, basi plerumque segmentis 1–2 praedita rarius subcordata, utrinque subviridia et plus minusve crispule albo-villosa ; folia media sessilia vel breviter petiolata, irregulariter dentata, cordata, acutiuscula vel acuta ; floralia infima crenata, e basi ovata vel cordata, apice abrupte attenuata, superiora integra, breviter et molliter ciliatula, calyces superantia vel aequantia. *Verticillastra* 6–2-flora, internodiis calycibus longioribus vel summis brevioribus, summa interdum sterilia. *Calyx* longe tubulosus, tubo striato, pilis albis ± longe vestito, circiter 5 mm. longus, labiis brevibus aequalibus, superiore subaequaliter tridentato, inferiore dentibus triangularibus ut in superiore spinuloso-purpureo-mucronatis. *Corolla* circiter 1·5 cm. longa, tubo incurvo intus nudo sensim in faucem ampliato, labio superiore incurvo inferiore paulo longiore, glabra.

S. Persia. In agro ecbatanensi (Media), *Pichler* (Iter persicum J. E Polak 1882).

var. **tomentosa** *Parsa*, var. nov, a typo caulibus copiose hirsutis, foliis supra viridibus infra albo-tomentosis.

W. Persia. Kashvar, a station on the Trans-Persian railway near Burujird, 1200 m., in open ground, flowers bluish, *Trott* 718.

Salvia (**Aethiopis**) **kourossia** *Parsa*, sp. nov. inter *Gongrosphaceas S. atropatanae* Bunge proxima, sed foliis inferioribus ovato-elongatis (nec oblongis vel lineari-lanceolatis), floralibus calyces aequantibus (nec dimidio brevioribus), verticillastris 4–2-floris distinguitur.

Herba perennis, radice lignosa verticali crassa ; caules floriferi erecti foliosi, circiter 40–60 cm. alti. *Folia* basalia rosulata, ovata, cum petiolis 1·5–5 cm. longa et 2–3 cm. lata, obtusa, eroso-crenata vel lobis crenulatis lobata, utrinque molliter albo-tomentosa, in partibus superioribus glandulosa ; folia caulina inferiora similia sed margine irregulariter crenata ; caulina media diminuta, sessilia, tomentosa ; superiora basi cordata amplexicaulia vel subdecurrentia, irregulariter eroso-dentata, supra viridia et parce, subtus densissime, araneoso-tomentosa, apice abrupte et plus minus longe acuminata, 1–2 cm. longa et 1–1·5 cm. lata. *Verticillastra* numerosa, remota, internodiis 2·5–3 cm. longis, 4–2-flora.

Flores conferti, magni, pedicellis 3–4 mm. longis. *Calyx* dense glandulosus, campanulatus, a basi pallido-viridis, dentibus brevibus triangulari-ovatis longiuscule spinulosis, spinulis albis et subrigidis, tribus superioribus conniventibus, labio inferiore et superiore divergentibus nec porrectis. *Corolla* 16—18 mm. longa eleganter curvato-erecta, glabra (galeae apice dorso breviter villosa excepta), albo-purpurea. *Antherarum* connectivum elongatum. *Stylus* longe exsertus.

S. Persia. Shahzad-i-Kuh, 3000 m., 1 July 1940, *Parsa* 501.

Salvia sulcata *Parsa*, sp. nov. in sectione *Aethiopide* Benth. calyce quadridentato (dente medio labii superioris subaborto) insignis ; corolla (ut inter *Homalosphaceas*) tubo sensim in faucem ampliato intus squamularum destituto.

Herba perennis, radice crassiuscula verticali sanguinea. *Caules* erecti, 50–60 cm. alti, basi pallidi ceterum purpurei, pilis albis mollibus patentibus copiose villosi, sulcati (sulcis alternatim albis et viridibus) angulis rotundatis, ramosi, internodiis 2·5–3 cm. longis subaequalibus. *Folia* basalia rosulata, cum petiolo 15–20 cm. longa, lamina petiolo anguste alato subaequali pinnatisecta (rhachide alata alba), segmentis 12–20 mm. longis et 3–5 mm. latis nervo medio albo percursis viridibus molliter hirtulis apice obtusis marginibus plus minus profunde pinnatipartitis vel serrato-dentatis ; caulina inferiora breviter petiolata vel subsessilia gradatim diminuta, 4–12 cm. longa, profunde pinnatipartita, segmentis terminalibus pinnatipartitis acutis ; caulina media lanceolata, molliter et patente albo-villosa, alia inferioribus similia, alia integra lanceolata sessilia apice longe subulato-attenuata in spinulam albam abeuntia ; floralia lanceolata valde inaequalia 5–15 mm. longa et 1–4 mm. lata, omnia spinuloso-mucronulata. *Verticillastra* 1–2-flora, internodiis calycis longitudinem sub-brevioribus, in quoque ramulo circiter 3. *Pedicelli* 2–3 mm. longi. *Calyx* subcampanulatus, purpureo-viridis, copiose et longe albo-hirtus, 13–15 mm. longus, lobis subaequalibus, dentibus superioribus binis aequalibus (medio in spinulam minutam redacto vel obsoleto) triangularibus abrupte in acumen setaceo-subulatum 5–6 mm. longum angustatis rectis, inferioribus conformibus. *Corolla* circiter 20 mm. longa, rosea, extra patente albo-hirtula, tubo recto sensim et modice inter dentes calycis labii ampliato, labio superiore subrecto inferiore vix breviore.

N. Persia. Meshkambar, 1400 m., 14 June 1941, *Parsa*.

Salvia viridis L. var. **lutea** *Parsa*, var. nov. a typo foliis lobato-crenatis (nec crenulatis), floralibus calycibus vix brevioribus, corollis luteis (nec violaceis) distinguenda.

N. Persia. Chalus valley, 300 m., 31 May 1938, *Parsa* 747.

Scutellaria (Lupulinaria) ramazanica *Parsa*, sp. nov. *S. bornmuelleri* Hausskn. affinis, foliis sessilibus utrinque viridibus, bracteis inferne et apice purpureis, floribus 1–2-jugis recedens.

Herba perennis, e basi indurata lignescente multicaulis, praeter indumentum minutissimum pulverulentum vel superne hirtulum glabra, caulibus 20–25 cm. altis, tenuibus, simplicibus vel a basi ramis binis

floriferis auctis. *Folia* caulina inferiora et media ovata, 10–12 mm. longa et 4–5 mm. lata, subsessilia, basi truncata, apice acuta, margine crenato-dentata (dentibus utrinque 4–5), superioribus ovato-lanceolata, 1 cm. longa et 3 mm. lata, basi amplexicaulia, apice acuta, plana (nullo modo rugosa), utrinque viridia, glabra ; omnia internodiis eximie breviora. *Bracteae* ovatae, 3·5 mm. longa et 1·2–2 mm. lata, concava, caudatim subulato-angustata, minute hirtula, inferne et apice purpurea. *Racemi* spiciformes e floribus 2–3-jugis compositi, 1–2 cm. longi, bracteis internodia aequantibus. *Flores* pedicellis calycibus subaequalibus suffulti. *Calyx* floriferus parvus, 1 mm. longus, minute hirtulus. *Corolla* circiter 20 mm. longa, extra patule albo-velutina, flavido-purpurea.

N. Persia. Meshkambar, 1400 m., 14 June 1941, *Parsa* 862.

Stachys shirini *Parsa*, sp. nov. in sectione *Eriostachyde* et seriei *Micrantharum S. setiferae* C. A. Mey. proxima, sed caulibus simplicibus nec ramosis, verticillastris 4–5-floris, corolla minute hirtula recedit.

Herba perennis, pallide virens vel canescens, caulibus erectis elatis 40–50 cm. altis simplicibus. *Folia* membranacea, oblonga ; inferiora et media petiolata, petiolo 3–6 mm. longo, lamina 2·5–3 cm. longa et 5–8 mm. lata, subintegra vel paucidentata, minute et sparse hirtula, apice spinulosa ; superiora subsessilia, in floralia sessilia verticillastra superantia gradatim diminuta. *Verticillastra* 4–5-flora, distantia. *Bracteae* triangulari-lanceolatae, tubo calycino vix breviores, longiuscule flavido-spinulosae. *Flores* purpurei, siccitate lutei, sessiles vel subsessiles, 9–11 mm. longis. *Calyx* 4 mm. longus, pilis albis patentibus vestitus, dentibus triangularibus 1 mm. longis spinis longiusculis flavidis erectis praeditis. *Corolla* purpurea, parcissime hirtula, tubo breviter exserto, labio superiore breviore integro vel retuso, inferiore trilobato lobis lateralibus brevissimis ascendentibus obtusis medio retuso ; stamina 4, purpurea exserta ; stylus inclusus.

S. Persia. Elika, 2600 m., 3 July 1941, *Parsa* 262.

Plantaginaceae.

Plantago griffithii *Decne.* var. **glabra** *Parsa*, var. nov. planta glabra scapis confertifloris subglobosis distincta.

S. Persia. Kerman, in monte Schah Kuh ditionis Rahbur, 3600 m., 25 July, 1892, *Bornmuller* 4604 (type : *P. griffithii* Decne. β *alpina Bornm.* MS.)

S.E. Persia. Kerman, in pratis alpinis montis Kuh-Lalesar, 3500 m., 17 July 1892, *Bornmuller* 4607 (*P. griffithii* Decne. β *alpina* Bornm. f. *minor* Bornm. MS.).

Bornmuller 4606, from the same locality as 4607, is labelled with the unpublished name var. *nivalis* Bornm. It may be distinguished as a form with narrower lanceolate leaves.

Chenopodiaceae.

Kochia scoparia L. var. **appendiculata** *Bornm. ex Parsa*, var. nov. perigonii lobis appendiculatis distincta.

S.E. Persia. Kerman, in incultis, 1900 m., 23 Aug. 1892, *Bornmuller* 4220.

SANTALACEAE.

Osyris daruma *Parsa*, sp. nov. *O. albae* L. affinis sed foliis ellipticis, cymis masculis femineisque paucifloris, floribus subsessilibus, bracteis subpersistentibus satis distincta.

Frutex sempervirens, ramis brunneis amygdaliformibus subtomentellis, ramulis horizontalibus cano-tomentellis brevibus. *Folia* breviter petiolata vel subsessilia, elliptica, circiter 1 cm. longa et 4–5 mm. lata, apice mucronulata, viridi-grisea, valde tomentella crassiuscula. *Inflorescentia* longiuscule et laxe racemosa, cymis in axi racemi lateralibus masculis femineisque 1-paucifloris subsessilibus. *Bracteae* minutissimae, 1 mm. longae, subpersistentes, velutinae. *Perigonium* tripartitum, segmentis ovatis sensim vel abrupte mucronatis. *Stamina* 3, filamentis brevibus, antheris bilocularibus. *Ovarium* carnosum, breviter cano-velutinum, inferum. *Stylus* brevis, viridis ; stigmata 3, flavido-punicea, lobis subretusis. *Drupa* ovoideo-globosa ; semen drupam implens, albumine copioso.

S.E. PERSIA. Chahbahar, Tiss, March 1940, *Parsa* 81.

EUPHORBIACEAE.

Euphorbia connata *Boiss.* var. **glabra** *Bornm. ex Parsa*, var. nov. planta omnino glabra distinguenda.

E. PERSIA. Yesd, in desertis prope Mohammedabad, 1491500 m., 9 Apr. 1892, *Bornmuller* 4687.

Euphorbia erythradenia *Boiss.* var. **depauperata** *Hausskn. ex Parsa*, var. nov. foliis brevioribus, 3–3·5 mm. longis et 1·5–2 mm. latis, caulibus numerosis.

S. PERSIA. Kerman, in monte Kuh-i-Sirdsch et Kuk-i-Nasr, 3600–3900 m., 23–24 Nov. 1892, *Bornmuller* 4694. In monte Kuh-i-Dahupar (inter Kerman et Bandar Abbas), 3400–3800 m., 12 June 1892, *Bornmuller* 4695.

Euphorbia kazerouni *Parsa*, sp. nov. facie *E. erythradeniae* Boiss. sed involucro utrinque glabro, lobis haud ciliatis, glandulis denticulatis lateraliter bidentatis (nec pectinatim et breviter bi- vel saepius quadricornutis) diversissima.

Herba perennis, glauca, caulibus ascendentibus 30–40 cm. altis glabris striatis scoparie ramosis laxe foliosis, ramulis tenuiter virgatis. *Folia* parva, oblongo-elliptica vel obovata, 5–12 mm. longa et 4–7 mm. lata, obtusa, integra, sessilia, carnosula ; floralia obovato-orbicularia vel orbicularia, saepe submucronulata. *Umbellae* radiis 2–7, mediis brevissimis 2–3 mm. longis ceteris elongatis 10–20 mm. longis brunneis. *Involucrum* breviter campanulatum, carnosulum, luteum, utrinque glabrum, lobis late ovatis apice truncatis nudis, glandulis quadratis apice denticulatis (denticulis paucis 3–5). *Capsulae* oblongae, nigrae, paucisulcatae.

S. PERSIA. Kasrun (Kazeroun), in vineyards, 7 May 1885, *Stapf* 891 (type). Fars, Karaagatsch near Khane Zaenian, 2 June 1885, *Stapf* 1691.

var. **stricta** *Parsa*, var. nov. foliis non elongatis, caulibus subsimplicibus. E. Persia. Khorasan, common on dry stony exposed hillsides over 1800 m., 18 June 1885, *Aitchison* 678.

This species belongs to sect. *Tithymalus* ser. *Esulae* in Boissier's classification (Fl. Or. 4, 1085 : 1879) and is to be placed amongst the perennial species of his group * * * * *semina irregulariter foveata, malleata vel reticulato-rugosa.*

Euphorbia osyridiformis *Parsa*, sp. nov. *E. osyrideae* Boiss. affinis, caulibus glabris (nec pruinoso-tomentellis), inflorescentiis in racemum dispositis, involucro glabro (nec tomentello), capsula glabra differt.

Herba perennis, basi suffruticosa, caulibus ascendentibus erectis elatis 50–60 cm. altis glabris vel sparsissime pilosulis subsimplicibus laxe foliati. *Folia* lineari-lanceolata 7–8 cm. longa, 5–7 mm. lata, apice acuta, basi abrupte angustata, sessilia, flavido-virentia, superiora sensim breviora. *Inflorescentiae* terminales umbellatae, umbellis 5–10-radiatis, radiis circiter 1 cm. longis ; inferiores axillares pedunculis 1–5 cm. longis suffultae. *Bracteae* 2, obovatae obovato-ellipticae vel ellipticae, erosulo-denticulatae vel paucidentatae vel subintegrae, glabrae. *Involucri glandulae* transverse oblongae, semilunatae, crassiusculae, aurantiacae. *Capsula* pedicellata, atra (matura haud visa), glabra.

S. Persia. Kuh Disch, near Daescht-aerdschen (Dasht-i-Arjin), Shiraz, 29 May 1885, *Stapf.*

This species belongs to series *Osyrideae* of section *Tithymalus* in Boissier's classification (Fl. Or. **4.** 1083 : 1879).

Moraceae.

Ficus carica L. var. **longipes** *Bornm. ex Parsa*, var. nov. foliis multo minoribus, circiter 3 cm. longa et lata, fructibus parvis pedunculis 1–2 cm. longis distincta.

S.E. Persia. Kerman, in rupibus ad Kermandschahan, 18–1900 m., 11 Apr. 1892, *Bornmuller* 4508.

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XLVII*

Annonaceae new to British Guiana.

Rob. E. Fries.

By the courtesy of Mr. N. Y. Sandwith, a collection of *Annonaceae* from British Guiana, collected there in recent years by the local Forest Department, has been sent to me for determination from the Kew Herbarium. The material was exceedingly well preserved and proved to contain a great deal of interest contributing to the elucidation of the Annonaceous flora of this area. The collection, coupled with our previous knowledge, proves this family to be exceedingly well represented in British Guiana. No less than half of the total of twenty identifiable species in the collection are now for the first time reported from that country, and six of these have proved to be new species. These are described below, with some supplementary observations on the already known species.

Oxandra guianensis *R. E. Fr.*, sp. nov.

Arbor circiter 12 m. alta ; ramuli novelli dense ferrugineo-sericeo-tomentosi, glabrescentes et nigricantes. *Foliorum* petiolus 3–5 mm. longus, niger et fere glaber, supra canaliculatus ; lamina coriacea, exsiccata sordide olivacea (6–) 8–12 cm. longa et (2–) 4–5 cm. lata, ovalis vel rarius obovata, apice in cuspidem brevem acutam angustata, basi abscissa et in utroque latere dentiformi-producta, ad marginem et subtus in costa primo pilis ferrugineis longis subadpressis instructa, mox glabrescens et adulta utraque facie glaberrima sed punctulis verruciformibus minutissimis creberrime obtecta ; costa supra valde et anguste impressa, subtus alte prominens ; nervi secundarii sicut venularum reticulum fere inconspicui. *Flores* ignoti. *Fructus* 1 (–3) axillares vel saepius ex axillis foliorum nuper delapsorum exeuntes ; pedicelli rigidi, 3–5 mm. longi, infra medium bracteis biseriatis circiter 4 rigidis rotundatis et obtusissimis glabris sed primo brevissime ciliatis ornati, ad medium articulati et supra articulationem unibracteati. *Sepala* bracteis similia, inter se libera, 1·5–2 mm. longa. *Monocarpia* circiter 6 sed saepe non omnia evoluta, globoso-ellipsoidea, basi et apice rotundata vel interdum brevissime acuminata. exsiccata nigra et rugulosa, 7–8 mm. longa et 5–6 mm. diametro, stipitibus 3–5 mm. longis sustenta.

British Guiana. Big Winiperu Creek, Demerara River, in understorey of mixed forest, fruit dull plum-colour, March 4th, 1940, *D. B. Fanshawe* in *Forest Dept.* record no. 3124 (type in Herb. Kew.).

Vernacular name (Arawak), *Arara.*

The axillary fruits, and their stipitate monocarps, give to the species an appearance reminiscent of the genus *Guatteria.* A closer examination of the fruit pedicels indicates, however, that this is a species of *Oxandra,* as proved by the occurrence of the distichous bracts so characteristic of this genus, one of which (although sometimes difficult to distinguish in the fruit stage of this specimen) is placed above the articulation typical of *Oxandra.* The same articulation, though without any bracts above it, exists in the genus *Guatteria* (cf. the notes on *Oxandra martiana* in *Acta Horti Bergiani*, **10,** p. 166).

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* Continued from K.B. **1941**, 232 (1942).

In the genus *Oxandra* the species now described is a third representative of the group which so far has included only *O. xylopioides* Diels and *O. major* R.E.Fr. As in these, the leaf base ends abruptly with one point directed downwards on either side of the petiole. *Oxandra guianensis* differs from these very distinctly, especially by its wholly different oval leaf.

Guatteria (Sect. **Pteropus**) **ovalifolia** *R.E.Fr.* in Acta Horti Bergiani, **12,** 428 (1939).

Mahdia River, Potaro River, 107 mls. Bartica-Potaro Road, *Forest Dept.* nos. 3735 and 4211.

As far as I know, this species has been found only in British Guiana, and has until now been collected only in the flowering stage. The fruits of the above no. 4211 may be described as follows : pedicelli fructiferi 2–2·5 cm. longi ; torus circiter 0·8 cm. diam. Monocarpia numerosa (circiter 30 vel verosimiliter interdum plura), ellipsoideo-fusiformia, utrinque breviter acutata, cinnamomea, rugosa, circiter 10 mm. longa et 5–6 mm. diam.

Vernacular name (Arawak), *Arara* (smooth-skin).

Guatteria (Sect. **Brachystemon**) **procera** *R. E. Fr.*, sp. nov.

Arbor ad 25 m. alta, trunco circiter 4 dm. diametro ; ramuli novelli pilis ferrugineis patentibus fere 1 mm. longis et sat diu persistentibus dense vestiti ; ramuli vetustiores cortice nigro laevi obtecti. *Foliorum* petiolus 4–6 mm. longus, pilosus sed mox glabrescens ; lamina chartacea, exsiccata obscura, ovato-lanceolata, basi breviter acuta, apicem acutissimum versus subsensim longeque caudato-angustata. novella supra pilis ferrugineis patentibus crispulis obsita, in costa densius et longius hirsuta, glabrescens, subtus praesertim in costa elevata setis circiter 1 mm. longis patentibus et sat diu persistentibus instructa, 8–12 cm. longa, 2·5–4 cm. lata ; nervi laterales primarii utroque latere 10–12, tenues, venulis utrinque prominulis vix crassiores. *Flores* axillares vel ex axillis foliorum nuper delapsorum solitarii ; pedicelli sat graciles, rigidi, pilis patulis longiusculis hirsuti, 1·5–2 cm. longi, ad vel vulgo infra medium articulati. *Sepala* reflexa, ovata, acuminata, extra pilis longis erectis ferrugineo-strigosa, intus basi nuda excepta ferrugineo-tomentosa, circiter 5 mm. longa. *Petala* 1·8–2 cm. longa et sub apice 0·8–1 cm. lata, basi extra dense sericea ceterumque tomentella, oblanceolata et obtusiuscula vel acuta, marginibus ad medium conspicue retroflexis, parte laminae superiore plana. *Stamina* 1 mm. longa, disco connectivi plano glabro. *Monocarpia* numerosissima, anguste oblonga, minute apiculata, exsiccata nigra, 9–10 mm. longa et 4–4·5 mm. diametro, stipitibus gracilibus 18–20 mm. longis sustenta.

British Guiana. Barabara Creek, lower Essequibo River, in mixed forest, aromatic bark, with flowers and fruits Nov. 26th, 1942, *Forest Dept.* no. 3676 (type in Herb. Kew.).

Vernacular name (Arawak), *Arara* (smooth-skin).

This species belongs to Sect. *Brachystemon* R. E. Fr. In the list of representatives of this section (see Rob. E. Fries in *Acta Horti Bergiani*, **12,** p. 454) it should be placed near *G. peckoltiana* R. E. Fr. and *G. sellowiana*

Schlecht. It differs from both by the long, fairly scanty hairs sticking straight out from the young shoot axes and pedicels, while from *G. peckoltiana* it is further distinguished by the larger and broader ovate-lanceolate leaves, and the long adpressed hairs on the outer sides of the sepals and petals, and from *G. sellowiana* by the long pedicels, the completely hairless connective discs, the long and slender monocarp stipes, etc. Actually, however, it is not very closely related to these South Brazilian species. *G. procera* approaches far more closely to *G. brachypoda* described below ; for the differences, see the latter species.

Guatteria (Sect. **Brachystemon**) **brachypoda** *R. E. Fr.*, sp. nov.

Arbor circiter 20 m. alta, trunco circiter 0·3 m. diametro ; ramuli novelli pilis patentibus ferrugineis dense vestiti. *Foliorum* petiolus 5–7 mm. longus, ramulorum indumento obtectus; lamina 12–15 cm. longa, 2·5–3 (–4) cm. lata, chartacea, exsiccata nigrescens, lanceolata vel anguste oblongo-lanceolata, basi sat longe angustata, acuta et paulo in petiolum decurrens, apicem versus longe subsensim angustata, summo apice obtusa, supra primo breviter, in costa densissime ferrugineo-hirsuta, plus minus glabrescens, subtus pilis patentibus longis obsita ; nervi laterales primarii utroque latere 15–18, utrinque prominuli. *Flores* axillares, solitarii ; pedicelli rigidi, 7–9 mm. longi, ferrugineo-holosericei. *Sepala* reflexa, extra sicut petala dense sericea, ovata, acutiuscula, circiter 5 mm. longa. *Petala* ad 16 mm. longa, basi extra aureo-sericea ceterumque tomentella, e basi angustata spathulata, apice late rotundata et infra apicem 9–10 mm. lata, secundum margines plus minus revoluta. *Stamina* 1 mm. longa ; discus connectivi minute papillatus sed non hirsutus. *Monocarpia* atra, ellipsoideo-pyriformia, apice breviter apiculata, 9–10 mm. longa, 5·5–6 mm. diametro, stipitibus 10–14 mm. longis gracilibus instructa.

British Guiana. Mazaruni Station, in mixed forest, with flowers and fruits, June 23rd 1942, *Forest Dept.* no. 3474 (type in Herb. Kew.).

Vernacular name (Arawak), *Arara* (smooth-skin).

As already pointed out under *Guatteria procera*, that plant is very closely related to *G. brachypoda* in the section *Brachystemon*. On cursory examination they seem to be identical, but a closer study will show various differences which, to my mind, necessitate a differentiation of the species. The leaves of *G. brachypoda* are on the average longer, and narrower in relation to their lengths ; the tapering at the base is slightly longer, and the much extended point is more blunt. The most obvious character is provided by the pedicels, which without any exception are scarcely half as long as in the other species. The flowers are, moreover, smaller, and their petals are more rounded at the point. Finally, the fruits are of slightly different shapes : narrow and elongated in *G. procera*, thicker and pear-shaped ellipsoidal in *G. brachypoda*. In the former, the monocarp stipes are, in addition, nearly twice as long.

Guatteria (Sect. **Mecocarpus**) **paludosa** *R. E. Fr.*, sp. nov.

Arbor circiter 12 m. alta, trunco 12·5 cm. diametro ; ramuli crassi, novelli pilis longis rigidis ferrugineis stricte adpressis dense obtecti. *Foliorum* petiolus verus brevis, 5–10 mm. longus, incrassatus, supra

canaliculatus, ramulorum indumento vestitus, mox glabrescens ; lamina pro rata gigantea, 35–40 cm. longa et ad medium 12–15 cm. lata, chartacea et exsiccata obscura, oblongo-elliptica, apice (in foliis obviis lacera) verosimiliter rotundato-acuta, basi rotundata, ima basi in partem angustam petioliformem transiens, alis 3–4 mm. latis ima basi rotundatis ornata ; laminae vetustiores supra glabrae, subtus pilis adpressis laxe disseminatis in nervis validioribus et praesertim in costa densioribus paratae, punctulis verruciformibus utraque facie sursum tamen magis conspicuis minutis dense instructae ; costa supra impressa, subtus valde elevata, teres ; nervi laterales primarii validi utrinque circiter 30, angulis circiter 80° exeuntes, pulchre paralleli, supra sat impressi, subtus elevati, circiter 3 mm. intra marginem regulariter arcuato-conjuncti. *Fructus* pedicellis 3 mm. crassis et 1·5–2 cm. longis sustenti ; torus semiglobosus, 12–15 mm. diametro, cicatricibus monocarpiorum delapsorum 30 vel ultra punctatus. *Monocarpia* ellipsoidea vel oblongo-ellipsoidea, basi et apice breviter acutata, exsiccata nigra, glabra, 6–8 mm. longe stipitata.

British Guiana. Mahdia River, Potaro River, 107 mls. Bartica-Potaro Road, common by creeks in Kataburi (*Rapatea*) swamp, Jan. 18th., 1943, *Forest Dept.* no. 3781 (type in Herb. Kew.). " Fruits cauliflorous, bunched, shiny, greenish, oblong, purple-black when ripe."

This species must be referred to Sect. *Mecocarpus* R. E. Fr., in which it is most closely related to *G. kuhlmannii* R. E. Fr. from northern Matto Grosso and *G. amazonica* R. E. Fr. from the Upper Amazon region and Peru. It differs sharply from these by its leaves being contracted at the base to a long, winged petiole-like part. The verrucae on both sides of the leaf are very small, sometimes rather indistinct. The monocarps are thicker, more ellipsoid with shorter points, and borne on thicker stipes than in *G. amazonica*, the only one of the two related species whose fruits are known.

The collection sent to me for examination contains another sheet which—in spite of certain differences—I have no hesitation in designating *Guatteria paludosa*. It was, as a matter of fact, collected in almost the same place as sample no. 3781 (Mahdia Creek, Potaro River, at 108 mls. Bartica-Potaro Road ; " common in the understorey of Kakaralli-Clump Wallaba bush on lateritic iron-stone soil, especially near creeks or swampy areas ; tree 50 ft. high 6 in. diam."). Its number in the collection is 3491 and it was collected on June 29th, 1942, when flowering material was obtained. As it is incorrect on principle to give two numbers as *typi speciei*, even if they are considered to be of the same species, I have selected one of them—the fructiferous sample—as the type. The other differs from this by the lower leaves of the shoot being obovate and cuneate at the base, most pronouncedly on the lowermost leaf, while the subsequent leaves, as they grow larger, become the giant leaves of the species described above. The following description of the flowers, which are not present on the type specimen, may be given here :

Flores solitarii, in ramulis fere 1 cm. crassis ex axillis foliorum delapsorum exeuntes ; pedicelli crassi, 1–1·2 cm. longi, pilis ferrugineo-cinereis dense sericei. *Sepala* late ovata, intus apice excepto glaberrima et nigra, extra sericea, 6–7 mm. longa, 5–7 mm. lata, secundum margines revoluta. *Petala* oblonga, exteriora apice rotundata, interiora truncato-

emarginata, omnia extra sericea, intus basi nuda excepta tomentella, circiter 2 cm. longa et circiter 1 cm. lata. *Stamina* 2 mm. longa ; connectivi discus brevissime albo-setulosus. *Ovaria* dense setosa.

Xylopia nitida *Dun.*, Monogr. Anon, 122, t. 20 (1817) ; R. E. Fries in Acta Horti Bergiani, **10,** 110 (1930).

Keriti Creek, Essequibo River, with flowers Sept. 29th, 1942, *Forest Dept.* no. 3604 (Herb. Kew.) ; tree 90–100 ft. high, 14–20 in. diam., with triangular plank buttresses to 3–4 ft. Mazaruni Station, with fruits, Jan. 29th, 1944, *Forest Dept.* no. 4295 (Herb. Kew.).

Vernacular name (Arawak), *Kuyama.*

Mr. N. Y. Sandwith informs me in a letter that he has found the British Guiana species *X. cinerea*, described by him in Kew Bull. 1930, p. 478, to be identical with *X.nitida* Dun. After examining the material now available of the two " species", I fully agree with his opinion. The known distribution of the species *X. nitida* accordingly extends from British Guiana across French Guiana to the delta of the Amazon River in the Brazilian state of Pará.

Duguetia (Sect. **Hadrantha**) **megalophylla** *R. E. Fr.*, sp. nov.

Arbor mediocris ; ramuli lepidibus aureis ad marginem fere integris dense vestiti. *Foliorum* petiolus crassus, 5–7 mm. longus ; lamina pro rata maxima, papyracea, exsiccata supra sordide viridis, subtus olivacea, supra laevis et glabra, subtus lepidibus orbicularibus laxis instructa, oblonga vel oblongo-obovata, vulgo ad medium latissima, basi rotundata et parum inaequilatera, apice in cuspidem obtusam 1–2 cm. longam sat abrupte contracta, 25–40 cm. longa et circiter 10 cm. lata ; costa supra impressa, subtus valde prominens teresque ; nervi laterales primarii utroque latere circiter 15, supra impressi, 4–6 mm. intra marginem arcubus regularibus conjuncti ; reticulum venularum sat densum, praesertim subtus elevatum. *Flores* oppositifolii (vel e ramis vel trunco evoluti ?), in rhipidiis lignosis multifloris densissimi sed unus tantum simul natus prioribus delapsis ; pedicellus 2·5–3·5 cm. longus, densissime aureo-lepidotus, paulo infra medium bractea ovata acuminata, extra dense lepidota intusque glabra, 5–7 mm. longa ornatus. *Sepala* basi 5–10 mm. longe coalita, late ovata et sensim longeque acuminata, adulta 3–5 cm. longa et 2·5–3 cm. lata, extra lepidibus orbicularibus subintegris primo aureis deinde decolorantibus argenteis densissime obtecta. *Petala* calyci subaequilonga vel paulo longiora, late ovata, intus basi glabra excepta tomentella, extra pilis stellatis et praesertim basin laminae versus lepidibus stellatis (radiis inter se vix vel basi tantum, rarius alte connatis) densissime vestita. *Stamina* filamentis brevissimis inclusis 3–4 mm. longa, disco connectivi convexo hirsuto. *Pistilla* circiter 7 mm. longa, basi stellato-lepidota, ceterum glabra. *Fructus* (immaturus) calyce exsiccato membranaceo persistente inclusus, globoso-ovoideus, 3 cm. longus (haud rite evolutus) ; carpidia numerosa, basi glabra, vertice cinereo-lepidota et acumine longo sursum curvato armata.

British Guiana. Takutu Creek to Puruni River, Mazaruni River, undergrowth tree to 30 ft. high and 2 in. diam., locally frequent in a small area of mixed forest on a high ridge, Nov. 13th, 1944, *Forest Dept.* no. 4826 (type in Herb. Kew.).

Duguetia megalophylla seems to me to be best referred to Sect. *Hadrantha* R. E. Fr., as it agrees with this especially in the strongly developed sepals, the lobes of which are joined fairly high up from the base. On the whole, its indumentum also agrees with that of the species of the *Hadrantha* section, even though the stellate scales are not as prominent on the petals. The dense, distinct hispidity of the large connective discs of the new species is common to the two *Hadrantha* species of which flowers are known.

Duguetia megalophylla differs from the 3 species of this section hitherto known, by the large dimensions of its leaves (in habit, however, these are rather reminiscent of the leaves of *D. ulei*), by its long pedicels, by the pointed shape of its upper bract, and by its larger and broader sepals and petals, etc. Another characteristic of this species is that the flowers are arranged in inflorescences (rhipidiums) of exactly the same peculiar structure as that which is characteristic of *D. bracteosa* Mart. There are some further points of contact with Sect. *Megaerisma* R. E. Fr., to which *D. bracteosa* belongs.

Duguetia (Sect. **Synsepalantha**) **guianensis** *R. E. Fr.*, sp. nov.

Frutex ramulis gracilibus, novellis dense stellato-lepidotis. *Foliorum* petiolus 3–5 mm. longus, demum glaber, niger ; lamina membranacea, exsiccata sordide viridis concolor, supra glaberrima laevis, subtus novella stellato-lepidota, glabrescens at demum lepidibus rarissimis instructa, oblanceolata, basi acutissima et in petiolum sensim decurrens, apice modice abrupte in cuspidem obtusam 1–2 cm. longam contracta, 10–15 cm. longa et 3–5 cm. lata ; costa basin versus supra impressa, subtus prominens semiteres ; nervi secundarii tenues, venulis vix crassiores, sicut reticulum praesertim subtus prominuli. *Flos* (unicus obvius) oppositifolius solitarius ; pedicellus 8 mm. longus, dense lepidotus, infra medium bracteam 3 mm. longam gerens. *Sepala* membranacea, rotundato-ovata, breviter acutata et fere ad medium coalita, 22–25 mm. longa et 20 mm. lata, extra lepidibus stellatis minutissimis obsita, intus cinereo-tomentella. *Petala* exsiccata nigrescentia, omnia fere similia, oblongo-lanceolata, obtusa, calycem vix superantia, 1·8–2 cm. longa et 5–6 mm. lata, extra pilis stellatis (radiis basi inter se brevissime coalitis) rarissimis instructa ceterumque glaberrima, intus omnino glabra. *Stamina* 1·2–1·3 mm. longa, connectivi appendice lata papillosa. *Fructus* globosus, 2–2·5 cm. diametro, calyce exsiccato membranaceo persistente involutus ; carpidia nigra, pyriformia, 1 cm. longa et 0·8 cm. crassa, parte inferiore angulata glabra, superiore semiglobosa et apice minutissime apiculata, glabrescente, nigra et rugulosa.

British Guiana. Madray-Bubu trail, Essequibo-Demerara, Feb. 8th, 1944, *Forest Dept.* no. 4427 (type in Herb. Kew.). " Shrub of low Kakirio forest on weathered limestone. Flowers solitary or two together, palest cream ; outer perianth segments papery, inner fleshy crimson at base, tips involute."

Unfortunately the material available of this new species is very scanty, but as there are both inflorescences and fruits I have nevertheless thought it expedient to describe it. In my opinion it should be referred to Sect. *Synsepalantha* R. E. Fr. on account of its calyx structure—with large sepals

joined together high up—and, especially, on account of the shape of, and the almost complete lack of hair and scales on, its petals. Hardly any of its petal characters can be distinguished from those of the *Synsepalantha* species *D. macrocalyx* R. E. Fr. (also from British Guiana). The new species, however, also has proper stellate scales on the young shoots and the undersides of the leaves, which is contrary to the diagnosis of the *Synsepalantha* section ; an extension of its characteristics is therefore necessary.

Duguetia guianensis also differs from both the hitherto known species of this section by its leaves being smaller and acute at their bases, from *D. asterotricha* Diels by the considerably smaller flowers, and from *D. macrocalyx* by its lack of the large bracts which distinguish that species.

The collection also contained the following species hitherto not reported from British Guiana :

Ephredanthus guianensis *R. E. Fr.* in Acta Horti Bergiani, **10,** 176 (1931).

Takutu Creek to Puruni River, Mazaruni River, from Greenheart forest, *Forest Dept.* no. 4788.

Vernacular name (Arawak), *Karishiri.*

This species has previously been known only from Surinam, and one variety from French Guiana. The specimens agree with the type from Surinam, except that the petals are slightly more thinly covered by hairs. The flowers were exclusively male, as in the material from Surinam and French Guiana.

Guatteria chrysopetala (*Steud.*) *Miq.* in Linnaea, **22,** 466 (1849) ; Rob. E. Fries, l.c. **12,** 434 (1939).

Anabisi Creek, Barima River, tree 50 ft. high, 6 in. diam., with smooth black skin, from *Iryanthera* marsh forest on pegass, *Forest Dept.* no. 5244.

Vernacular name (Arawak), *Black yarriyarri.*

So far known from Surinam, while one variety has been described from French Guiana and another from Pará in Brazil.

Oxandra asbecki (*Pulle*) *R. E. Fr.*, l.c. **10,** 167 (1931).

Takutu Creek to Puruni River, Mazaruni River, *Forest Dept.* no. 4836. Potaro River, 107 mls. Bartica-Potaro Road, from Clump Wallaba forest, *Forest Dept.* no. 3789 : tree 50–70 ft. high, 6–8 in. diam., unbuttressed, with aromatic bark.

Hitherto known only from Surinam and French Guiana.

Unonopsis perrottetii (*A.DC.*) *R. E. Fr.* in Sv. Vet. Akad. Handl. **34,** 5, 26 (1900).

Takutu Creek to Puruni River, Mazaruni River, in mixed forest, *Forest Dept.* nos. 4835 and 4900.

Vernacular name (Arawak), *Karishiri.*

Hitherto known from French Guiana, where it seems to be common. It is probably also to be found in Surinam, between French and British Guiana.

EARLY COLLECTION OF PLANTS IN PRINCE EDWARD ISLAND.

In the year 1841 Miss Anne Elizabeth Grubbe, an English girl of twenty-three, went out with her father John Grubbe of Horsenden House, Bucks., to the young colony of Prince Edward Island. He settled with his younger children at Holland Grove, in Charlotte Town, and Falconwood, a country house. At the same time his elder children made their home in Southwold, Suffolk. Mr. Grubbe died in 1846, and in 1847 his daughter married Thomas Heath Haviland, Q.C., of Charlotte Town, who afterwards became Lieut.-Governor of the Island.

Two years ago, in the old house in Southwold, there was found a small number of specimens collected by Mrs. Haviland in Prince Edward Island between 1849 and 1854. At some time she or her family must have brought them to England unless possibly her niece Miss Julia Grubbe, who herself collected in Southwold and elsewhere, paid a visit to Prince Edward Island and brought them home as souvenirs. At any rate, this small collection of thirty-two specimens was given to the writer for the Kew Herbarium, and after careful enquiries in every likely quarter, no trace can be found of anything earlier from Prince Edward Island. The founder of the Botanical Society of Canada, Dr. Lawson, remarks in his opening address in 1860 at Kingston, Ontario, "we already have observers from Red River in the West to Prince Edward Island in the East." Mrs. Heath Haviland may well have been one of the latter.

The plants are what might be expected, and include *Cornus canadensis*, *Rhodora canadensis*, *Kalmia angustifolia*, *Ledum latifolium*, *Epigaea repens*, *Moneses uniflora*, *Linnaea borealis*, *Betula papyrifera*, two species of *Pyrola*, and four of *Lycopodium*.

A few of the specimens are too fragmentary for certain identification, but a complete list of the collection is preserved at Kew. It was presented in 1944 by Miss Margaret Grubbe of Blythburgh, Suffolk.

M. M. Whiting.

Teucrium plectranthoides *Gamble*—In Kew Bull. 1946, 50, I made an amendment to Gamble's original description of this plant, and quoted *Hooper and Ramaswami's* sheet no. 38609 collected in 1913, as supplementary material.

I was not aware at that time that Ramaswami had actually published a description of the plant in Latin together with a plate in the Rec. Bot. Surv. India, **6,** 153 (1914), tab. 2. As, however, Ramaswami gave no specific name to the plant, merely calling it *Teucrium* sp., his effort did not constitute valid publication, and it remained for Gamble, working on different material to give this very distinct species a name (Kew Bull. **1924,** 266).

I am indebted to Dr. S. K. Mukerjee of the Calcutta Botanical Garden for the information which is the substance of this note.—D. Chatterjee.

EUONYMUS FRIGIDUS WALL. AND ITS ALLIES.

R. A. Blakelock

These species are sufficiently clearly distinguished from the rest of the genus to be dealt with separately. The group comprises those species which possess evergreen or semipersistent leaves, and an oblate-globose capsule, which is only slightly lobed and provided with well developed wings. Some of the deciduous *Euonymi*, such as the European *E. latifolius* Scop. and the Chinese species *E. amygdalifolius* Franch. and *E. sanguineus* Loes. have very similar capsules and are closely related. As in *E. latifolius*, the winter-buds in *E. frigidus* and its allies are very acute and often large.

Key.

Flowers 4-merous (rarely 3-merous) :

Leaves serrate :

Veins on leaves arising at an angle of about 45° or more to midrib ; capsule wings 2–5 mm. long, attached towards base of capsule, usually directed backwards when young.

Leaves long acuminate ; inflorescence 7–15-fl.

Leaves oblong or lanceolate ; shrub or small tree . . . . . 1. *frigidus* Wall. var. *typicus*.

Leaves linear or linear-oblong ; shrub . . . . . 1. *frigidus* var. *elongatus*.

Leaves wide elliptic obovate or oblanceolate ; dwarf under-shrub or shrub . . . . . 1. *frigidus* var. *wardii*.

Leaves shortly acuminate, acute or rounded ; infl. 3–7-fl. ; sub-shrub 0.3–0.9 m. high, branching and rooting at the base. 2. *pygmaeus* W.W.Sm.

Veins usually arising at a more acute angle to midrib ; capsule wings 3–12 mm. long, attached more towards the middle of the capsule and turned usually laterally or forwards when young :

Capsule wings 3–5 mm. long, rounded ; infl. 7–12-fl. ; fls. 2–3 mm. diam. across sepals . . . . . 3. *cornutoides* Loes.

Capsule wings 7–13 mm. long, tapering ; infl. usually 3-fl. ; fls. 4–6 mm. in diam. across sepals . . . . . 4. *cornutus* Hemsl. var. *typicus*.

Leaves entire . . . . . 5. *kweichowensis* Wang.

Flowers 5-merous :

Leaves serrate almost to base :

Leaves linear-lanceolate, long acuminate, as in *E. cornutus* except for 5-merous flowers . . . . . 4. *cornutus* var. *quinquecornutus*

Leaves oblong or elliptic, acute or shortly acuminate . . . . . 8. *latifolius* Scop. f. *sempervirens*

Leaves entire or entire in lower half :

Leaves lanceolate or oblong, veins scarcely prominent and not reticulate above, prominent and reticulate below . . . . . 6. *rehderianus* Loes.

Leaves oblong to ovate, veins scarcely prominent but reticulate above, prominent and reticulate below . . 7. *assamicus* sp. nov.

Unless otherwise stated the specimens cited are in the Kew Herbarium. B.M. stands for the British Museum, South Kensington.

1. **E. frigidus** Wall. var. **typicus** var. nov. ; Wall. in Roxb. Fl. Ind. ed. Carey et Wall. **2,** 409 (1824) ; Lawson ex Hook. f. Fl. Brit. Ind. **1,** 611 (1875) ; Gamble Trees etc. Darjeeling 18 (1878) ; Loes. in Engl. Bot. Jahrb. **30,** 458 (1902) ; Smith et Cave in Rec. Bot. Surv. Ind. **4,** 183 (1911) ; Smith l.c. **4,** 360 (1913) ; Brandis Ind. Trees 159 (1911) ; Cowan et Cowan Trees of N. Bengal 35 (1929) ; Comb. in Notes R. Bot. Gard. Edinb. **18,** 240 (1934) ; Kanjilal, Das et Purkayastha Flora of Assam **1,** II. 265 (1936).

E. burmanicus Merrill in Brittonia **4,** 105 (1941) ; Kingdon Ward in Journ. Bombay Nat. Hist. Soc. **45,** 29 (1944).

Leaves evergreen (rarely semipersistent ?) ; veins prominent and reticulate above and below, rarely almost smooth below. *Inflorescence* 7–14-fl. *Flowers* 2–5 mm. diam. across the sepals ; 4–12 mm. diam. across the petals ; petals greenish yellow or purple, sometimes whitish at margins (*in sicco*). *Capsule* often reticulate venose towards apex.

Nepal. Gosain Than, *Wallich*, 4288 a (type).

Sikkim. Tonglo and Singalelah, 8–12000 ft., *Hook.f.* ; Tonglo road, Darjeeling, 7–9000 ft., Oct. 1874, May 1879 *Gamble* 1913 A, 6944 ; Rungborb [?] marsh, 7000 ft., 11.7.1876, *do.*, 809 A ; Rimitli [?], 8000 ft., Nov. 1881, *do.*, 10029 ; Yakla, 9000 ft., 10.5.1876, *C. B. Clarke* 27854 A, 27854 B.

Assam. Delei valley, 28° 21′ N. 96° 37′ E., 8000–10000 ft., 6.6.1928, *Kingdon Ward* 8304.

Burma. Adung Valley, 28° 25′ N. 97° 55′ E., 6–7000 ft., 7.2.31, *Kingdon Ward* 9216 ; do., 8.4.31, *do.* 9376 (type of *E. burmanicus* Merr.) ; do., 6000 ft., 11.11.31, do., 10152. (B.M.; these three specimens sub " aff. *E. oblongifolia* Loes. & Rehd.")

Cult. Cornwall, 28.11.1945, 3.6.1947, *G. H. Johnstone* (grown from *Kingdon Ward* 10124 ; the leaf-shape approaches that of var. *wardii*).

Wallich's sheet no. 4288 in the Herbarium of the East India Company now at Kew bears three species. They are as follows :

(1) marked " a " from Gosain Than. This is the type of *E. frigidus*. The fruits show the characteristic wings and venose reticulations. The leaves are oblong, acuminate, up to 10 cm. long and 3·3 cm. wide. All the leaves are on hornotine wood, suggesting that either *E. frigidus* is deciduous or semipersistent at times, or that the older leaves have been lost in mounting the specimen. The rest of the material of *E. frigidus* has leaves on the old wood. The leaves are thinner and more finely serrate in the type specimen than in other material of this species.

(2) marked " b " from Kamaon. A species that is near to *E. fimbriatus* Wall., but which has only simply serrate leaf-margins, and the wings of the capsule only 6 mm. long.

(3) a fruit of *E. grandiflorus* Wall., which has presumably been included here in error.

a. var. **elongatus** Cowan et Cowan l.c. 35 (1929) ; Kanjilal l.c. 265 (1936).

Sikkim. Tonglo, Darjeeling, 10000–10080 ft., Nov. 1874, July 1882, *Gamble* 1921, 1921 A, 10406 (type of var. *elongatus*) ; Lachong, Chola, Sinchul, Tonglo, Lachen, 8–12000 ft., 1849, *Hook.f.* ; Mon [?] Lepcha, 8000 ft., 27.10.1874, *C.N.* 997 ; Rechi La, 9000 ft., 1904, *Haines* 2574.

Bhutan. Chendebi, 7500 ft., 2.6.1938, *Gould* 352.

Assam. Manipur, Keyang Ching Sow, Svivhifurar, N.E. Ranges, 8000 ft., 12 and 22.4.1882, *Watt* 6704, 6743 ; Japvo, Naga Hills, 25° 40′ N. 94° 10′ E., 8–9000 ft., 1.12.1927, *Kingdon Ward* 7726 ; Base Camp, Seinghku Wang, 7000 ft., 26.5.1926, *do.* 6774.

One of Hooker's specimens has flowering stems c. 40 cm. high, which are rooting and creeping at the base.

b. var. **wardii** (W.W.Sm.) stat. nov. ; W.W.Sm. in Notes R.B.G. Edinb. **10**, 37 (1917) pro. sp.

Leaves wide elliptic, obovate or oblanceolate, 7·7–16 cm. long, 2·9–6·5 cm. wide, long acuminate, nerves prominent on both surfaces. *Flowers* 10–12 mm. diam. across petals, 4–5 mm. diam. across sepals.

Assam. Valley of Seingku, 28° 5′ N. 97° 30′ E., 9000–10000 ft., in fruit, dwarf undershrub growing on the steep flank of the limestone ridge, in Rhododendron thickets, 24.10.1926, *Kingdon Ward* 7614.

E. Upper Burma. At Htawgaw, valley of Naung-Chaung, Lashi country, small shrub of loose habit, 8–12 ft., flowers greenish, damp shady gullies in forest, 15.5.1914, *do.* 1543 (type Herb. Edinb.).

Yunnan. On the N'Maikha-Salween divide, 26° 10′ N., 9000 ft., in thickets, shrub of 3–6 ft., flowers purplish-green, June 1919, *Forrest* 18088 (flowers in bud).

The petals of the type specimen (*in sicco*) are much tinged with purple with a whitish margin, despite the field note " flowers greenish". The flowers in this specimen are as often 3-merous as 4-merous.

The flowers in the type of var. *wardii* are slightly larger than in vars. *typicus* and *elongatus*, with sepals up to 3 mm. wide and petals up to 7 mm. long and 5 mm. wide. In vars. *typicus* and *elongatus* the sepals are up to 2 mm. wide and the petals up to 6 mm. long and 5 mm. wide. In view of the variation in flower-size and leaf-shape in *E. frigidus* s.l., var. *wardii* cannot be regarded as a distinct species.

It may be mentioned here that Hooker's Sikkim specimens in Herb. Kew determined as "*E. frigidus*" include a species not in the group of Euonymus discussed here—*E. viburnoides* Prain (syn. *E. forrestii* Comb., *E. chengkangensis* C. W. Wang). Griffiths specimen from Bhotan, cited by Lawson (l.c.) as "*E. frigidus*", is *E. lawsonii* C. B. Clarke ; also not closely related to *E. frigidus*.

2. **E. pygmaeus** W. W. Sm. in Notes R. Bot. Gard. Edinb. **10,** 35 (1917) ; Chung in Mem. Sci. Soc. China **1,** 144 (1924) ; Rehd. in Man. Cult. Trees and Shrubs 558 (1940).

E. taliensis auct. in Notes R. Bot. Gard. Edinb. **17,** 311 (1930).

Leaves semipersistent, lanceolate or elliptic-oblong, base cuneate ; veins prominent and scarcely reticulate above, prominent and reticulate

below. *Flowers* 5–6 mm. in diam. across petals, 3 mm. diam. across sepals ; petals sometimes whitish at margins (*in sicco*) or purplish green. *Capsule* venose reticulate towards apex.

China. Yunnan. W. flank of Shweli-Salween divide, 25° 21′ N., 7–8000 ft., Aug. 1912, *Forrest* 8961 (type, Herb. Kew. and Herb. Edinb.) ; in side valleys on the N'Maikha-Salween divide, 26° 21′ N., 9–1000 ft., June 1918, *do.* 18101 ; no loc., 11000 ft., 1924, *do.* 24298.

Assam. Delei valley, 10–11000 ft., 1.6.1928, *Kingdon Ward* 8277.

Some of the specimens collected in early summer have no old leaves, showing that the leaves are semipersistent rather than evergreen. The capsule is very like that of *E. frigidus*.

Possibly this is only a variety of *E. frigidus*.

3. **E. cornutoides** Loes. in Notes R. Bot. Gard. Edinb. **8,** 2 (1913) et **7,** 193 (1912).

E. cornuta auct. not Hemsl. in l.c. **17,** 319 (1930) ; Comb. in l.c. **18,** 240 (1934).

Shrub up to 20 ft. *Leaves* linear-lanceolate, long acuminate ; veins ± prominent and reticulate above, below smooth or scarcely prominent not reticulate. *Flowers* 5–10 mm. across petals ; petals green or purple, sometimes whitish at the margins (*in sicco*).

China. Yunnan. Eastern flank of the Lichiang Range, 27° 25′ N., 10000–11000 ft., Oct. 1906, *Forrest* 3094 (type) (*non vidi*) ; Eastern flank of the Tali Range, 25° 40′ N., 9–10000 ft., July 1910, *do.* 7275 ; N'Maikha-Salween divide, 26° 30′ N., 8000 ft., July 1919, *do.* 18197 ; Shweli-Salween divide, 25° 10′ N., 98° 45′ E., 9000 ft., Apr. 1921, *do.* 19356 ; Chienchuan-Melong divide, 26° 20′ N. 99° 20′ E., 10000 ft., June 1923, *do.* 23482 ; Shweli-Salween divide, 25° 30′ N. 98° 58′ E., 10000–11000 ft., May 1924, *do.* 24292 ; same loc., 25° 45′ N. 98° 58′ E., 10000 ft., Sept. 1924, *do.* 2519.

Assam. Delei valley, 28° 22′ N. 96° 37′ E., 8–10000 ft., 14.5.1928, *Kingdon Ward* 8185.

S.E. Tibet. Valley of the Di Chu, 28° 15′ N., 97° 15′ E., 8–9000 ft., 10.11.1926, *do.* 7645.

Burma. W. flank of the Chimili, N'Maikha-Salween divide, 26° 23′ N. 98° 48′ E., 10–11000 ft., Sept. 1924, *Forrest* 25057 ; Adung Valley, 8–9000 ft., 13.5.1931, *Kingdon Ward* 9469 (B.M.).

4. **E. cornutus** Hemsl. var. **typicus** var. nov. ; Hemsl. in Kew Bull. 209 (1893) ; Loes. ex Diels in Engl. Bot. Jahrb. **29,** 441 (1900) et **30,** 458 (1902) ; Loes. et Rehder ex Sargent, Pl. Wilson., **1,** 489 (1913) ; Lingdsheim et Loes. ex Limpricht in Fedde, Rep. Sp. Nov. **12,** 435 (1922); Chung in Mem. Sci. Soc. China **1,** 142 (1924) ; Comber in Notes R. Bot. Gard. Edinb. **18,** 240 (1934) ; Merrill in Brittonia **4,** 105 (1941).

Shrub up to 3 m. tall. *Leaves* evergreen, linear-lanceolate, long acuminate ; veins prominent and reticulate above and usually so below. *Inflorescence* usually 3-fl. *Flowers* 7–14 mm. diam. across petals ; petals purple sometimes with a whitish margin (*in sicco*).

China. Hupeh, *Henry* 5442 A (type) ; N.W. Yunnan, Ku-Tan-Ho valley, slopes of the Salween-Irrawadi divide, lat. about 26°, 9000–10000 ft., Nov. 1905, *G. Forrest* 1088 ; W. China, *Wilson* 3333 A ; W. Szechuan, Pan-lan-shan, west of Kuan Hsien, bush 2–3 m. high, Oct. 1910, *do.* 4291. var. **quinquecornutus** (Comb.) stat. nov. ; Comb. in Notes R. Bot. Gard. Edinb. **18,** 243 (1934) *pro sp.* ; Hand.-Mazz. Symb. Sin. pt. vii, 663 (1933).

China. Hupeh, Chienshih or Fang, *Henry* 5954 A, 6815 A (type) ; Fang Hsien, 2000–2300 m., Nov. 1907, *Wilson* 558 ; Chienshi, June 1906, *do.* 913. Shensi. Tai-pei-shan, 1910, *W. Purdom* 432. Szechuan. West and near Wên-ch'uan Hsien, 1600–2300 m., July, Sept. 1908, *Wilson* 1047, 1049 ; west of Kuan-Hsien, 2000–2600 m., June 1908, *do.*, 3014, 3017 ; no. loc., June 1908, *do.* 3015 ; Mt. Omi, Sept. 1904, *do.* 4791 ; Omei Hsien, Mt. Omi, 8500–9000 ft., 13.8.1928, *W. P. Fang* 2909 ; Omei-shan, 20.7.1930, *do.* 7763 ; Hung-ya-hsien, 19.8.1930, *do.* 8355 ; Tien-chuan-hsien, 2400 m., 17.5.1936, *K. L. Chu* 2562. C. China. Kui, Aug. 1907, *Wilson* 707a. W. China, July 1903, *do.* 3333.

A bush of this variety cultivated at Kew shed all its leaves during the hot dry weather of Aug. 1947. The single capsule produced by the bush was retained.

5. **E. kweichowensis** Wang in Chinese Journ. Bot. **1**, 51 (1936) ; Contrib. Bot. Surv. N.W. China **1,** 44 (1939) ; ab *E. rehderiano* Loes. capsula 4-mera, alis capsulae longioribus, foliis supra magis reticulatis ; ab *E. cornuto* Hemsl. alis capsulae latioribus, foliis integris differt.

Frutex 3 m. altus. *Ramuli* tetragoni deinde teretes, glabri, laeves. *Gemmae hiemales* magnae, conicae, acutae. *Folia* opposita, semper-virentia, tenuiter coriacea, glabra, lineari-lanceolata, apice longe acuminata, basi cuneata, subtus vix pallidiora, margine integra, nervis supra prominentibus et reticulatis, subtus parum prominentibus parum reticulatus, 2·5– c. 1·4 cm. longa, 0·7–2·3 cm. lata ; petioli 0·7–1 cm. longi. *Pedunculi* 3·3–6·8 cm. longi. *Pedicelli* 8–10 mm. longi. *Flores* ignoti. *Capsula* oblato-globosa, abortu 2–3-sperma, fere ex apice ad basin 4-alata, 5–7 mm. longa, alis triangularibus, longis, apice angustatis, obtusis, c. 10 mm. longis, 5–8 mm. latis.

China. Kweichow, Niu Ton Shan, Fan Ching San, 1700 m.,shade, rocky slope, fruit greenish, seeds scarlet, 17.9.1931, *A. N. Steward, C. Y. Cheo* and *H. C. Cheo* 606 in Herb. Kew et B.M. (type at Fan Memorial Institute, China).

As this species is intermediate in character between *E. rehderianus* and *E. cornutus*, and occurs farther to the east than either, it is provisionally regarded as distinct.

6. **E. rehderianus** Loes. ex Sargent Pl. Wilson. **1,** 488 (1913) ; Kingdon Ward in Gard. Chron. ser. 3, **92,** 428 (1932) ; Rehder in Journ. Arn. Arb. **14,** 245 (1933).

E. bicolor Lévl. in Fedde Rep. **13,** 260 (1914) ; Loes. in Ber. Deutsch. Bot. Ges. **32,** 540 (1914) ; Rehder l.c.

E. proteus Lévl. l.c. ; Loes. l.c. ; Rehder l.c.

Shrub up to 8 m. high. *Leaves* evergreen, acuminate, c. 1·5–9 (rarely 11·2 cm.) long, 0·7–3·5 cm. wide. *Inflorescence* c. 11-fl. *Flowers* 3–4 mm. diam. across sepals, 7–8 mm. diam. across petals ; petals whitish (*in sicco*). *Capsule* with rounded wings 2–5 mm. long, longest towards middle of the capsule.

China. Szechuan. Mupin, 1600–2300 m., Oct. 1908, *Wilson* 1132 (type) ; Mt. Omi, May 1904, *do.* 4787 ; Omei Hsien, Mt. Omi, 4500–5000 ft., 19.8.1926, *W. P. Fang* 3195 ; Omei-shan, 16 and 22.7.1930, *do.* 7656, 7835 ; Tachienlu, 9000–13500 ft., *A. E. Pratt* 794. Kouy-Tcheou [Kweichow]. Long-Ly, Ma-Jo, Nov. 1907 (1905 ?), *Cavalerie* 2238 (type of *E. bicolor*) ; Pai-Tchen, 30.3.1905, *do.* (type od *E. proteus*, *non vidi*).

E. bicolor Léveillé has been reduced to a synonym by Loesener after the examination of a fruiting specimen. Type material in Herb. Kew shows no fruit. The leaves are rather larger (up to 11·2 cm. long) than the other specimens of *E. rehderianus*, and the petioles are thicker and more wrinkled. The texture, venation and entire margin of the leaf, however, agree well with those of *E. rehderianus*.

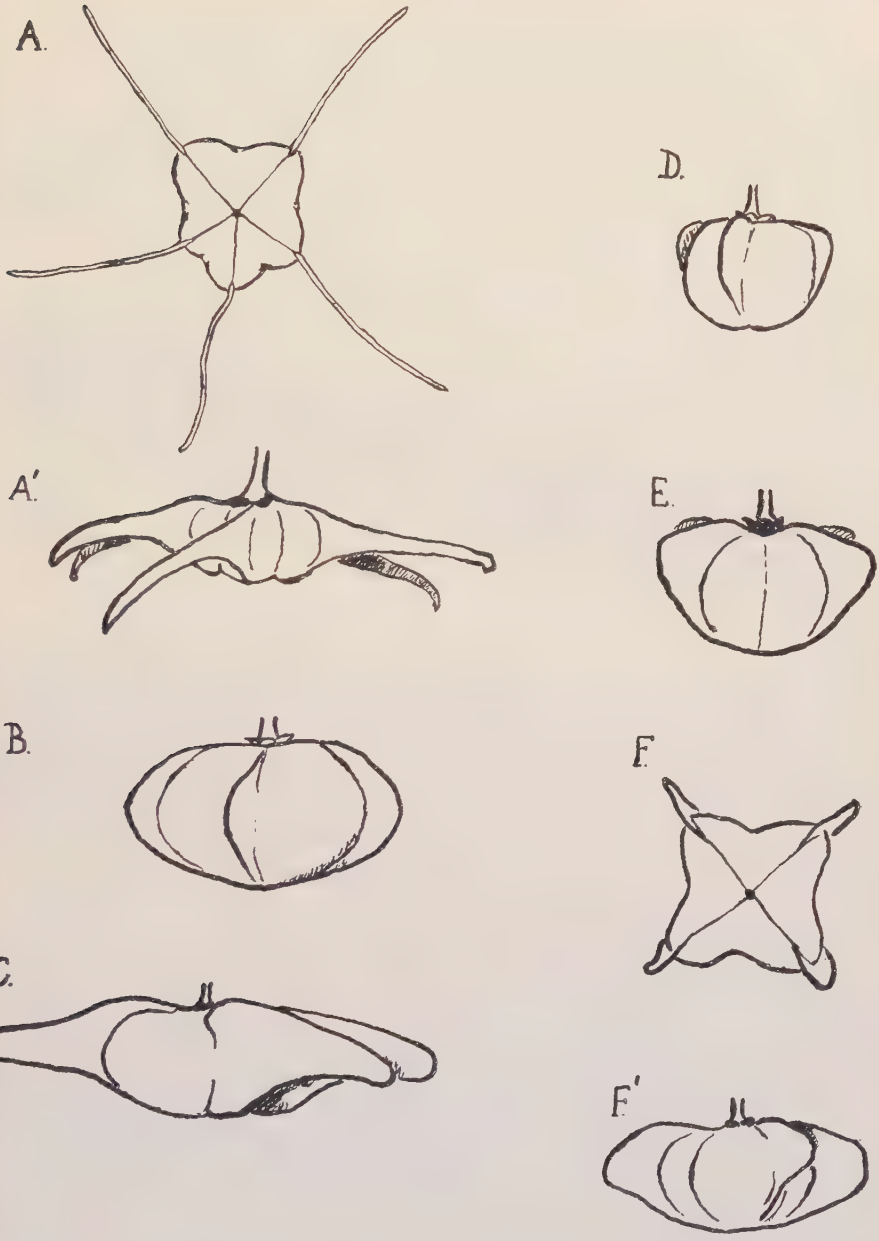
E. proteus is described by Léveillé as having leaves "nunc intergerrima nunc undulata nunc sub lente valida denticulata." This is also included by Loesener in *E. rehderianus*. Rehder in 1933 took the same view of these two names.

Wilson 4787 was placed by Loesener under *E. myrianthus* Hemsl. in Pl. Wilson **1,** 487. The capsules are very young, but show that they are winged and not lobed as in *E. myrianthus*. The capsules are very young, but show that they are winged and not lobed as in *E. myrianthus*. The leaves in Wilson's plant have more numerous small teeth in the upper half of the leaf than is usual in *E. rehderianus*, but are not so coarsely serrate as in *E. myrianthus*. *Pratt* 794 shows flowers but no fruit ; the leaves are a good match for those of *Wilson* 4787.

7. **E. assamicus** sp. nov. ; ab *E. rehderiano* Loes. foliis majoribus, discoloribus, utrinque magis reticulatis ; ab *E. integrifolio* floribus 5-meris, foliis latioribus differt.

Arbor parva. *Ramuli* teretes, laeves, glabri. *Folia* opposita, semper-virentia, tenuiter coriacea, glabra, oblonga, elliptica vel ovata, apice longe acuminata, basi rotundata vel cuneato-rotundata, subtus pallidiora, margine integra, nervis supra reticulatis et leviter prominentibus, subtus prominentibus et reticulatis ; 6–11·5 cm. longa, 2·5–6 cm. lata ; petioli 8–13 mm. longi. *Inflorescentia* 20–30-fl. (vel ultra) ; pedunculis 2.8–8 cm. longis ; pedicellis 2–3 mm. longis. *Flores* 5-meri, 6 mm. diametro ; sepala minute rubro-punctata, margine integra, 0·5–1 mm. longa, c.1 mm. lata ; petala ± orbiculata, cremea, minute rubro-punctata, margine integra, 2–3 mm. longa, 2–3 mm. lata ; discus c. 2 mm. diam. ; antherae subsessiles late reniformes, thecis lateralibus apice confluentibus rima continua dehiscentibus, post dehiscentiam patelliformes ; stigma sessile. *Capsula* immatura late 5-alata.

N. Assam. Delei valley, 28° 5′ N. 96° 30′ E., 5000 ft., flowers cream, a small tree, crowded with blossom, in a thicket on the sunny side of the steep rocky face, 19.3.1928, *F. Kingdon Ward* 7972 (type).



A. *Euonymus cornutus* var. *quinquecornutus*, apical view of capsule
A_1. *Euonymus cornutus* var. *quinquecornutus*, lateral view of capsule.
B. *E. rehderianus*, lateral view.
C. *E. kweichowensis*, lateral view.
D. *E. pygmaeus*, lateral view.
E. *E. frigidus*, lateral view.
F. *E. cornutoides*, apical view.
F_1. *E. cornutoides*, lateral view.

The fruit are too young to show the proportions of the capsule and its wings for certain, but they will probably be much like those of *E. kweichowensis*.

8. **E. latifolius** Scop. f. **sempervirens** (Rupr.) E. Busch ex Kuzn., N. Busch et Fomin Fl. Cauc. Crit. **3,** viii, 31 et 44 (1912). pro sp. Rupr. ex Boiss. Fl. Or. **2,** 10 (1872) : Kuzn. [Element Mediterr.-Reg. in W. Transcauc.] 112 (1891) ; Stojanoff in Engl. Bot. Jahrb. **62,** 528 (1929). Non *E. sempervirens* Marsh Arb. Am. 44 (1836).

Leaves with veins reticulate and scarcely prominent above, prominent and reticulate below, 1·6–4·2 cm. wide, 3·2–8 cm. long. *Capsule* with rounded wings up to 10 cm. long.

Caucasus. Galathi prope Kutais, Colchis, Imeretia, 14.11.1860, *Ruprecht* (type) ; vallis fl. Adzharis-tskali, ad marginem sylvae, 22.8.1910, *G. Woronow* 1906.

The original description gives the leaves as evergreen. These specimens have only leaves on the wood which has grown in the same spring ; so the leaves are semipersistent at most, and not really evergreen. Busch states that the leaves last until February.

The flowers I have not seen, but they are described by Busch as like those of *E. latifolius*.

This form is very closely related to *E. latifolius*, differing only in the semipersistent leaves. It is only included here as a matter of convenience, and may not have any near affinity to the Far Eastern species.

†Another species may be mentioned here :

E. roseoperulatus Loes. in Notes R. Bot. Gard. Edinb. **8,** 1 (1913) et **7,** 266 (1912) ; Comb. l.c. **18,** 238 (1934) sub *E. amygdalifolia* Franch.

China. Yunnan, Eastern flank of the Tali Range, 25° 40′ N., 8000–9000 ft., May–June 1906, *G. Forrest* 4756 (type in Herb. Edinb.)

This is possibly in the group dealt with above, but in the absence of flowers and fruits, it is impossible to reach any conclusion. It differs from *E. amygdalifolius* Franch. in having evergreen leaves.

STUDIES IN THE ERICALES : VIII.*

A New Section of Vaccinium from the Eastern Himalaya.

H. K. Airy Shaw

In his " Vaccinioideen-Studien ", in Engler, *Bot. Jahrb.* **71** (4), 432 (1941), Sleumer described a new species from Upper Burma and Assam, *Vaccinium paucicrenatum* Sleumer, which he placed, with evident misgiving, in the Section *Vitis-idaea*. As he pointed out, it differed from the remaining species of that Section in its solitary axillary flowers, differing also from the solitary-flowered species of Section *Conchophyllum* in its denticulate, acute leaves, elevate nervation, and floral characters (urceolate, shortly lobed corolla, and ecalcarate anthers).

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* Continued from *Kew Bull.* **1948,** 161 (1948).

† *E. szechuanensis* Wang in Contrib. Bot. Surv. N.W. China **1,** 49 (1939) e descr. resembles *E. cornutus* var. *quinquecornutus* except for having oblong or elliptic-oblong rarely obovate-oblong leaves. It is not stated if the leaves are deciduous or evergreen, and it must remain a doubtful species for the present.

It is possible that *V. paucicrenatum* may represent an extreme reduction from the *Vitis-idaea* (Sect.) type, since a second new species has come to light which is evidently of the same affinity and in some respects intermediate between *V. paucicrenatum* and Sect. *Vitis-idaea*. But this new species, described below as *V. setipes*, possesses the very unusual, if not unique, character of setulose-hispid pedicels, the setulae increasing in length at the apex of the pedicel and surrounding the base of the ovary. In the practically sessile flower of *V. paucicrenatum* there is room on the pedicel only for the insertion of the "involucre" of 20 or so chaffy bracts, but at the extreme apex, just below the articulation, there is a ring of short hairs which clearly represent the vestiges of the conspicuous setulae found in *V. setipes*.

I believe that these two species form a group sufficiently well-marked to constitute a section distinct from Sect. *Vitis-idaea*, and accordingly propose the following for their reception.

Sect. **Aëthopus*** *Airy Shaw*, sect. nov. ex affinitate Sect. *Vitis-idaeae* (Moench) Koch, sed floribus saepe solitaribus axillaribus interdum sessilibus, pedicellis setuloso-hispidis vel apice annulo pilorum brevium praeditis distincta.

Suffrutices epiphytici. *Caules* dense brunneo-setosi. *Folia* parva, 1–2 cm. longa, subsessilia, rhomboïdeo-ovata, acuta, distincte vel obscure denticulata, nervis supra plus minus impressis. *Flores* axillares vel subterminales, solitarii vel 2–3 fasciculati, sessiles vel breviter pedicellati ; pedicelli setuloso-hispidi vel apice annulo pilorum brevium praediti. *Corolla* urceolata, breviter lobata. *Filamenta* pilosa, basi expansa ; antherae ecalcaratae. *Ovarium* ut videtur 5-loculare.

Species 2, burmanico-assamicae. Typus : *Vaccinium paucicrenatum* Sleumer.

1. **Vaccinium setipes** *Airy Shaw*, sp. nov., ex affinitate generali *V. nummulariae* Hook. f. et Thoms. ex C. B. Clarke et *V. chaetotrichis* Sleumer, ramulis dense setosis, foliis ovatis serratis, floribus axillaribus (subterminalibus) fasciculatis, pedicellis setosis setis sub ovario elongatis, calycis segmentis elongato-triangularibus distinctissima.—*Vaccinium* sp., Burkill in *Rec. Bot. Surv. Ind.* **10** (2), 42, 52, 312 (1925). *V. paucicrenatum* Sleumer, *l.c.*, quoad specimen *Burkill* citatum.

Suffrutex epiphyticus, ramis elongatis parce ramosis angulato-striatis dense fusco-brunneo-setosis. *Folia* ovata, 1·5–1·8 cm. longa, basi late cuneata, apice acuta, margine subreflexa, serrata, serraturis utrinque circiter 6, coriacea, haud nitida, siccitate utrinque olivaceo-brunnea, subtus glabra, costa nervisque prominulis, supra costa gracili prominula minute puberula excepta glabra, nervis leviter insculptis ; petiolus brevissimus. *Flores* per 2–3 in axillis supremis et mediis fasciculati, bracteis compluribus triangularibus vix 1 mm. longis suffulti. *Pedicelli* 3–4 mm. longi, breviter setosi, apice setis multis longioribus robustioribus ut videtur glandulosis ovarii basin amplectentibus instructi. *Receptaculum* (post anthesin tantum cognitum) ovoïdeo-globosum, 2–3 mm. diametro, glabrum. *Calycis* segmenta triangulari-lanceolata, 1–2 mm.

*αηθηϛ, unwonted, unusual ; πουϛ, foot.

longa, acuta, glabra, breviter connata, post anthesin erecta vel inflexa. *Corolla* et *stamina* ignota. *Discus* annularis, subaequalis. *Stylus* ignotus. *Fructus maturus* ignotus.

Assam. Outer Abor Hills, Ripshing Showit*, epiphyte at edge of swamp, 1650 m., 8 March 1912, *Burkill* 36976 (Herb. Kew.).

This very distinct species does not appear to be closely related to any hitherto described, except to the one below, although its general affinity lies with *V. nummularia* and *V. chaetothrix*. The setose-hispid pedicels are a curious and unique feature. It is unfortunate that all the corollas have fallen. This specimen was apparently included by Sleumer under his *V. paucicrenatum* (see below), as " Outer Arbor [sic] Hills, Ripshing, 1800 m. (J. H. Burkill)".

2. **Vaccinium paucicrenatum** *Sleumer* in Engl. *Bot. Jahrb.* **71** (4), 432 (1941) ; Merr. in *Brittonia*, 4 (1), 157 (1941) ; descr. hic amplif. *Airy Shaw*.—Floribus solitariis axillaribus sessilibus bracteis multis elongatis acuminatis scariosis circumdatis, in genere unica ; *V. setipedi* A. S. affinis, sed characteribus datis et insuper foliis multo minoribus vix vel obscurissime et apice tantum serrulatis nervis supra obscuris differt.

Suffrutex epiphytica. *Caules* copiose horizontaliter divaricato-ramosi 1–4 mm. crassi ; juniores dense rubido-brunneo-setosi, setis plus minus adpressis vel patulis ; vetustiores saepe mox plus minus glabrati. *Folia* parva, rhomboïdeo-elliptica, 9–12 mm. longa, 5–7 mm. lata, basi plerumque late cuneata, apice acuta vel subacuta, minute apiculata, margine reflexa apicem versus parce obscure denticulato-serrata, chartaceo-coriacea, praeter costam supra basin versus scaberulam glaberrima, siccitate utrinque olivacea, pagina superiore minute transverse rugulosa, nervis obscure impressis vel evanidis, pagina inferiore nervis prominulis percursa ; petiolus subnullus. *Flores* axillares, parce editi, sessiles. *Bracteae* circiter 20, stramineo-scariosae, 5 extimae minimae, triangulari-ovatae, vix 1 mm. longae, 5 intermediae 2–4 mm. longae, 10 intimae 5–6 mm. longae, majores lanceolatae, acuminatae, acutissimae, basi rotundatae, dorso superne carinatae, integrae vel minute erosulae, vitta media saturatius brunnea costaque tenui obscura interdum percursae. *Pedicellus* (bracteis occultus) 1 mm. longus, apice annulo pilorum brevissimorum instructus. *Receptaculum* turbinatum, 1·5 mm. longum, 2 mm. diametro, glabrum. *Calycis* segmenta subulata, acuta, 2·5–3 mm. longa, breviter connata, glabra. *Corolla* breviter urceolato-campanulata, 6 mm. longa, glabra, alba, breviter lobata, lobis 1–1·5 mm. longis deltoïdeis acutis reflexis. *Stamina* corollam aequantia : filamenta 2 mm. longa, applanata, basi subito rotundato-expansa, parce longiuscule pilosa ; antherae 3·7 mm. longae, paullo supra basin dorsifixae, thecis valde scabrido-papillosis in aristas tubulosas longissimas liberas rectas ecalcaratas desinentibus. *Discus* pulvinato-annularis, undulatus. *Stylus* 6 mm.longus, glaber, stigmate truncato haud expanso. *Fructus* ignotus.

Upper Burma. Tibet Frontier : Nam Tamai valley, 900–1200 m., 11 Jan. 1931, *F. Kingdon Ward* 9124 (Herb. Mus. Brit. and Arn. Arb.) : " An epiphyte, usually high up in jungle. Flowers white, just opening."

*So given on label, but cited as " Ripshing Sieng " by Burkill in *Rec. Bot. Surv. Ind., l.c.*

Ibid., 12–1500 m., 18 Jan. 1931, *F. Kingdon Ward* 9162 (Herb. Arn. Arb.) : " A small bushy undershrub in the forest. Flowers white—not yet open." Hills E. of Putao, 97° 30′ E., 27° 45′ N., 1500 m., 9 Dec. 1938, *F. Kingdon Ward* 13560 (*typus*, Herb. Mus. Brit.) : " A freely branching epiphytic undershrub. Stems bristly ; leaves glabrous, not so fleshy as those of no. 13540, more leathery. Flowers solitary, axillary, white. Perulae persistent. Style shortly exserted. Filaments hairy, anthers with two long erect projections."

This interesting species appears to represent a further step in reduction from *V. setipes* A.S. The inflorescence is reduced to a solitary subsessile flower, but this reduction is accompanied by an extraordinary develop- of the bracts, forming a chaffy involucre surrounding the flower. The ring of hairs encircling the base of the ovary evidently represents the last vestiges of the long setae that are so conspicuous at the apex of the pedicel in *V. setipes*. These two species form an isolated group within the genus, though their general affinity with *V. nummularia* seems evident.

A variety of this species, differing in its more abundantly produced flowers and much shorter and blunter involucral bracts, is represented by the following specimen :—

Bhutan. Sine loc. exact., *Booth* in *Herb. Nuttall* (Herb. Kew) : " Cotoneaster, parasitical, found upon oaks."

All the corollas have fallen from this specimen, and young fruits are beginning to form. Flowers are present in considerable numbers towards the ends of the year-old branches, sometimes in the axils of as many as six consecutive, or almost consecutive, leaves. The bracts are only 1–2 mm. in length, and so considerably shorter than the young globose fruits. The calyx segments are at first folded down across the top of the ovary, but eventually seem to be deciduous leaving an annular scar.

The Assam specimen (coll. *Burkill*) cited by Sleumer under this species (see above) is apparently the Kew specimen from which I have described *V. setipes* A.S., above.

LOGWOOD AND WRITING INK.

F. N. Howes.

During the war years a shortage of ink and difficulty in obtaining supplies led Archdeacon G. Burton, Principal of St. Andrew's College, Oyo, Nigeria, to investigate the possibility of producing ink for the College from logwood trees (*Haematoxylon campechianum* L.) that happened to be growing in the grounds of the institution. A considerable degree of success was achieved.

As the logwood tree (a native of Central America) is now in cultivation in most parts of the tropics and is easily grown, it is thought the formula eventually used and now kindly supplied by Archdeacon Burton may interest those in charge of other educational institutions in the tropics. Where large numbers of pupils are writing with ink daily the quantity used in the course of a year, especially in a hot climate, is quite considerable. Apart from the question of the availability of supplies the saving in cost effected from this use of a local material may also be an important consideration.

The method employed by Archdeacon Burton is described by him as follows :—

" *Logwood chips*, 3 lbs.

Boil for about two hours in *rain* water ; strain, and make up to *one gallon* (In practice I add sufficient water to leave the required volume after boiling). Allow to cool and add 60 *grains of potassium chromate* (neutral) previously dissolved in about an ounce of water. Then add 120 *grains of sodium carbonate* (crystalline) previously dissolved in an ounce of water. Preserve by adding a trace of chloroform. For convenience I use an ounce of a solution of chloroform made by dissolving 1 part of chloroform in 2 parts of industrial methylated spirits (one in three).

This makes an easy-flowing ink which keeps for a considerable time.

The sodium carbonate is said to preserve the fluidity of the ink, but I have not had any experience of the ink becoming stringy. In the original literature I consulted years ago the ink was made from extract of logwood, and such may need sodium carbonate.

I find formaldehyde unsatisfactory as a preservative. Samples thus preserved deteriorated and the ink eventually became useless through some change in the pigment. Salicylic acid is also useless as a preservative."

Archdeacon Burton considers that possibly a smaller quantity of potassium chromate, say half the quantity stated, which starts the oxidation process, would be adequate. However, this chemical is not expensive and the quantity required not very large.

The ink produced by this method was found to keep for a considerable time stored in old petrol or kerosene tins (in the dark), although earthenware vessels, if available, might be an advantage. Archdeacon Burton states that he makes sufficient to last about six months and that

there is no indication of deterioration within that period. Samples stored in clear glass bottles did show deterioration after a long period.

Very soon after its manufacture the ink becomes jet black. For ordinary and for class purposes it was found to be entirely satisfactory in Nigeria. However, it must be pointed out that the real permanency or lasting qualities of the ink, after use, are not at present known, and it may be inadvisable to use the ink for important documents or records that are to be kept for a long time. A letter written with the ink two years ago has so far shown no sign of fading.

Logwood is one of the best known of the vegetable dyes and has a long and interesting history. Unlike many of the natural dyes, such as indigo, madder, cochineal, etc., it did not fall into complete disuse with the development of aniline dyes. It continued to be used mainly for the dyeing of blacks on silk and wool, and chiefly in combination with iron and chromium mordants. The fine black sheen of top hats is reputed to be due to the use of logwood. The dye also enters into the composition of numerous compound shades, for a wide range of colours may be obtained by employing different chemicals. The use of logwood in commcial ink manufacture is of long standing, not only for ordinary black writing ink but also for coloured writing inks and copying ink.

The quantity of logwood (or logwood extract) now used is very much less than formerly. In recent years the quantities imported to Great Britain have not exceeded a few hundred tons, whereas as far back as 1756 some 18,000 tons of logwood were imported to England from Honduras, and nearly double this amount in 1896 (Bull. Imp. Inst. **32,** 393–394). The first English trade in logwood commenced in 1665, about the time of the capture of Jamaica, but the Spaniards had already developed a trade in logwood from Campeche (from which the tree derives its name—*Haematoxylon campechianum*) and adjoining areas. The lucrative nature of the early logwood trade (the price of logwood in England at this time being £100 a ton) led to much buccaneering and strife between English and Spanish in the Caribbean region.

In the early days of the use of logwood in England, in the reign of Queen Elizabeth, the dye acquired a bad reputation, for nothing was known of the use of mordants for fixing the colour in those days and the logwood dye was prone to wash out from the cloth. This led to an Act of Parliament prohibiting the use of logwood and ordering it to be burned wherever it was found. The Act was entitled " An Act for the abolishing of certeine deceitful stuffe used in the dyeing of clothes" and went on to state that " Whereas there hath been brought from beyond the seas a certeine kind of stuffe called logwood, alias blockwood, wherewith divers dyers " etc., and " Whereas the clothes therewith dyed, are not only solde and uttered to the great deceit of the Queen's loving subjects, but beyond the seas, to the great discredit and sclaunder of the dyers of this realme. For reformation whereof, be it enacted by the Queen our Soveraygne Ladie, that all such logwood, in whose handes soever founde, shall be openly burned by authoritie of the maior." (The Art of Dyeing. J. Napier : 1853). The law was not repealed until about a century later by which time dyers had found out how to fix the colours permanently.

Jamaica has long been an important source of logwood. Before the tree was established there logwood was brought from the Mainland prior to despatch to Europe. There appears to be some doubt as to the date of the introduction of the tree to Jamaica from Central America. Some writers refer to its having been introduced to Jamaica by a Dr. Barham in 1715, whereas others state it did not reach Jamaica until 1751 (Bull. Imp. Inst. **32,** 393). However, the tree proved well suited to conditions in Jamaica and soon became naturalized. In 1837 Macfadyen (Flora of Jamaica) stated " Few plants have been so completely naturalized. It thrives in every situation, with the exception of the loftier mountains, and, with Opoponax and Cashaw occupies our plains." From Jamaica it spread to other West Indian islands and has now been introduced to most tropical countries.

It is not known when logwood was introduced to Nigeria but it is believed it may have been in the early 1890's. A tree at Old Calabar was bearing seed in 1897, being then about five years old (Holland, Useful Plants of Nigeria). Seedlings were supplied by the Nigerian Agricultural Department to St. Andrew's College, Oyo, in 1916, according to Archdeacon Burton.

Logwood has been much used as a hedge plant throughout the tropics. It thrives under a wide range of conditions and will resist drought when once established. On account of its small leaves and its prickly nature it is satisfactory both as an ornamental and as a defensive hedge (Kew Bull. 1946, 72). The flowers are a valued source of nectar to the honey bee and yield a good quality honey. Much of the honey produced in Jamaica is derived from the flowers of logwood.

During the war of 1914–19, when German supplies of chemical dyes to other countries suddenly ceased, a stimulus was given to the use of logwood and its production. In addition to supplies from Jamaica and the Caribbean region consignments were also received from Mauritius where the tree has long been naturalized.

Most of the logwood cut in Jamaica is from self-sown, rather than cultivated trees. The tree is regarded as well suited for waste lands which are unsuited for other crops, a satisfactory planting distance being 15 feet. Any suckers and side shoots that appear should be removed and the lower branches sawn off at a later stage to give clean straight trunks. Felling may be carried out at the age of about 10 years and the trunk cut into pieces 3–4 feet long. The useless sapwood is chipped off, a tedious operation, for only the heartwood contains the dye (haematoxylin). For converting the heartwood into chips or powder, prior to dyeing or making extract, powerful machinery is used. The manufacture of logwood extract in Jamaica considerably reduces freight charges.

An interesting point in regard to logwood in Jamaica is the existence of so-called " bastard logwood," an inferior or worthless form that contains little or no dye in the heartwood (see Kew Bull. 1916, pp. 221–224). In such trees the heartwood does not darken on exposure to air, but otherwise the trees are not distinguishable on morphological grounds

from ordinary logwood. For this reason it has been urged that when logwood seed is collected for sowing care should be taken to ascertain that the mother trees are not of the " bastard " type.

Note. An illustration of *Haematoxylon campechianum* appeared in *Kew Bulletin* No. 2, 1946, p. 72.

A NEW MYRISTICA FROM THE MALAY PENINSULA.

H. K. Airy Shaw.

The following new species of *Myristica* was collected by Mr. J. Wyatt-Smith, of the Forest Research Institute, Kepong, Selangor, in the course of an investigation into the detailed composition of a sample plot of tropical rain-forest.

Myristica wyatt-smithii *Airy Shaw*, sp. nov., *M. cumingii* Warb. (praesertim var. *floribundae* A.S.) affinis, a qua foliis crassioribus nervis primariis subtus obscurioribus multo minus argute prominentibus, petiolis multo crassioribus, floribus subglobosis nec oblongo-urceolatis, pedicellis crassioribus praecipue differt.

Arbor 18–24 m. alta. *Ramuli* 3–5 mm. crassi, glabri, cortice laevi siccitate longitudinaliter angulato-striato ± castaneo. *Folia* oblongo-oblanceolata vel subpanduriformia, 17–35 cm. longa, 6–11 cm. lata, basi late cuneata vel subrotundata, apice brevissime acuminata, supra medium saepe subito latiora, glaberrima, ut videtur subcarnoso-coriacea, siccitate surde sed pallide griseo-brunnea, costa subtus prominente supra subplana vel apicem versus prominula, nervis lateralibus 15–17-jugis late patulis gracilibus marginem versus procurvis et arcuato-anastomosantibus supra anguste impressis subtus prominulis sed plerumque (maxime subtus) obscuris, nervis minoribus laxe reticulatis raro manifestis ; petioli robusti, 2–3 cm. longi, 3–4 mm. crassi, supra e laminae marginibus bicarinati, subtus rugosi, siccitate fusco-castanei, glabri. *Inflorescentiae* ♂ in ramulis brevibus 2–5 cm. longis gemma perulata anguste lanceolata acuminata 8–17 m. longa minutissime cinereo-tomentella terminatis per 2–3 ortae, 4–5·5 cm. longae, pedunculo 2·5–4 cm. longo angulato-applanato, ramulis 2 vel 3 brevissimis flores 3–7 gerentibus, minutissime adpresso-puberulae ; pedicelli 7–8 mm. longi, minutissime puberuli. *Flores* subglobosi vel latissime ovoidei, 3–6 mm. diametro, basi bracteola suborbiculari subamplectente instructi ; perianthium breviter (vix ultra tertiam partem) trilobum, coriaceum, alabastro brevissime fulvo-tomentellum ; antherae circiter 12, in massam cylindricam circiter 2·5 mm. longam connatae, columna apice libera, stipite crasso 1·5 mm. longo. *Flores* ♀ et *fructus* ignoti.

Selangor. Kuala Lumpur distr. : Bukit Lagong Forest Reserve (sample plot), high forest on side and top of ridge, 390 and 450 m. alt., May–June 1947, *Forest Research Institute* 63176 (*J. Wyatt-Smith*, 6. v. 47 ; young ♂ infl.), 52149 (typus ! *For. Gd. Sow*, 13. v. 47 ; mature ♂ infl.), 64427 (*For. Gd. Sow*, 3. vi. 47 ; sterile) : " Tree, 80 ft. high, 9 in. diam. ; 60 ft. high, 15 in. diam. ; 60 ft. high, 8 in. diam. Dark scaly bark ; red blood on cutting." Vernacular name, *penarahan*.

The relatively obscure venation, thick petioles and globose flowers readily distinguish this species from *M. cumingii* Warb., of the Philippines,

and its variety *floribunda* Airy Shaw (in *Bull. Misc. Inf.*, Kew, **1939,** 539 : 1939), from Borneo. The variety, described from Sarawak and North Borneo (an additional collection from Sarawak, Entoyut River, Dec. 1894, *Hose* 392 (Herb. Kew.), has branched inflorescences up to 7·5 cm. long), actually represents a less reduced stage than the " type " of the species, which has very abbreviated inflorescences. When describing var. *floribunda* (*l.c. supra*), I drew attention to the fact that the degree of branching of the inflorescence, used by Warburg in his Monograph of the Myristicaceae as the primary key-character for the subdivision of the genus, was of relatively little importance as a guide to affinity. This is borne out by the discovery of the present species, which certainly appears referable to Warburg's Series 11 in spite of its branched inflorescence. A mistake in Warburg's key should be pointed out : on page 377, lines 9 and 13, the figures for the lengths of the peduncles (*Blüthenstandstiele*) of *M. suavis* King, on the one hand, and of *M. cumingii* Warb. and *M. tristis* Warb., on the other, should be deleted. Reference to the descriptions of these species, on pp. 441, 443 and 444, shows that the figures for the three species should be 2–4 mm., 3–9 mm. and 1–1·5 mm. respectively.

Myristica wyatt-smithii was accompanied by *M. gigantea* King, *M. maingayi* Hook. f. and a form resembling *M. borneensis* Warb.

Botanik der Gegenwart und Vorzeit in Culturhistorischer Entwickelung*.—The reprinting of this book marks the establishment of a new serial publication by the Chronica Botanica Co. under the title PALLAS. The new serial is, we understand, to be devoted to the reproduction by the photo-offset process of rare out-of-print and classical books of which Jessen's celebrated work, first published in 1864, forms volume I.

This clear and comprehensive epitome dealing with the history and development of botany from early Indian and Egyptian times up to the author's day is undoubtedly a valuable contribution to our knowledge of the subject and a most important milestone in botanical literature. It is therefore eminently worthy of this reproduction (if not of translation) which has been accomplished in such an excellent manner reflecting great credit on the enterprise of the publishers.

The volume has been entirely reprinted in facsimile from the first page to the last. In addition it contains a new title-page as well as the original, a brief foreword and a biographical notice of Jessen. The reprint will be much appreciated and welcomed by all those interested in the history of botany.

H.S.M.

*By K. F. W. Jessen. Published in PALLAS vol. **1** : 1943. Pp. xx + 495. Waltham, Mass. : The Chronica Botanica Co.; London, W.C.2 : Wm. Dawson & Sons, Ltd. Price $6.00.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS: XXIX.*

E. M. Marsden-Jones and W. B. Turrill.

Indumentum and calyx-shape in interspecific crosses.

In order to extend the study of the genetics of calyx shape crosses were made between an extreme variant of *S. maritima* with long cylindric calyces and two *S. vulgaris* plants with inflated calyces. The former bred true on selfing to long cylindric calyces and the two latter to inflated calyces. In the course of the investigation some peculiar features of indumentum (affecting position and occurrence) appeared.

The families dealt with in the present paper are :

N.110 = A.70 × N.12 plant 172 (83 plants).
N.224 = N.110 plant 9 selfed (69 plants).
N.225 = N.110 plant 43 selfed (68 plants).
N.226 = N.110 plant 46 selfed (37 plants).
N.227 = N.110 plant 60 selfed (43 plants).
N.111 = N.12 plant 251 × A.70 (87 plants).
N.228 = N.111 plant 5 selfed (26 plants).
N.229 = N.111 plant 17 selfed (79 plants).
N.230 = N.111 plant 25 selfed (70 plants).
N.116 = A.70 × N.12 plant 251 (42 plants).
N.232 = N.116 plant 29 selfed (70 plants).
N.233 = N.116 plant 17 selfed (70 plants).

Essential characters of plants used in breeding.

A.70 was described in *K.B.* 1939, 298.

N.12 plant 172 had the following characters : medium indumentum, shining green, calyx inflated, medium anthocyanin in calyx and vegetative parts, hermaphrodite, small scale, filaments and anthers purple, stigmata purple, immature seeds white, capsules ovoid-obloid, mature seeds weak armadillo. N.12 plant 172 was selfed and a family of 19 plants was raised (see *K.B.* 1935 : 216).

N.12 plant 251 had the following characters : few hairs, mat, calyx inflated, medium anthocyanin in calyx and vegetative parts, hermaphrodite, small scale, filaments and anthers purple, stigmata purple, immature seeds white, capsules ovoid-obloid, mature seeds armadillo. N.12 plant 251 was selfed and a family of 72 plants raised (see *K.B.* 1935 : 216).

N.110 plant 9 had calyx inflated, segments not overlap, hermaphrodite, filaments white, stigmata white, capsules hybrid type, seeds weak armadillo.

N.110 plant 43 had calyx subinflated, segments not overlap, hermaphrodite, filaments purple, stigmata purple, capsules hybrid type, seeds armadillo.

* Continued from K.B. 1948, 42.

N.110 plant 46 had calyx subinflated, segments not overlap, hermaphrodite, filaments purple, stigmata purple, capsules hybrid type, seeds armadillo.

N.110 plant 60 had calyx inflated, segments not overlap, hermaphrodite, filaments purple, stigmata white, capsules *maritima* type, seeds armadillo.

N.111 plant 5 had calyx subinflated, petals multiblobed, petals overlap, segments overlap, hermaphrodite, filaments purple, stigmata white.

N.111 plant 17 had calyx inflated, petals bilobed, petals overlap, segments overlap, hermaphrodite, filaments white, stigmata purple.

N.111 plant 25 had calyx inflated, petals bilobed, petals overlap, segments not overlap, hermaphrodite, filaments purple, stigmata white.

N.116 plant 29 had calyx inflated, petals bilobed, petals overlap, segments not overlap, filaments white, stigmata white.

N.116 plant 17 had calyx subinflated, petals multilobed, petals overlap, segments overlap, filaments white, stigmata purple.

Descriptions of F_1 and F_2 families.

In N.110, N.111, and N.116 all plants were scored for habit, anthocyanin and indumentum in vegetative parts, surface, shape and anthocyanin in calyx, zygomorphy, immature seed colour, fruit shape, and mature seed coats. Only a sample of plants from each family were scored fully for all characters investigated.

N.110 = A.70 × N.12 plant 172 (from selfing of B.5). 83 plants in the family.

Habit : all uniform spreading with flowering stems ascending, 4.5 dm. tall ; anthocyanin in vegetative parts medium ; all mat ; all glabrous.

Leaves : uniform, narrowly lanceolate, slightly acuminate, 2.4 cm. long, 0.7 cm. broad.

Inflorescence : up to 17 flowers, all slightly zygomorphic.

Calyx : inflated 25 : subinflated 58 ; all with medium anthocyanin.

Corolla : all white ; bilobed 11, 3/4 lobing 11, small scale 11, anthocyanin blotch absent 11 ; petals overlap 11 ; segments overlap in 1 : not overlap 10.

Sex : hermaphrodite 10 : hermaphrodite and female 1.

Androecium : filaments purple 9 : white 2 ; anthers purple 11.

Stigmata : purple 7 : white 4 ; immature seeds purple 83.

Ripe capsules : *maritima* type 2 : hybrid type 79.

Mature seeds : weak armadillo 33 : armadillo 48.

Winter condition : mostly complete dying down, some showed a little green growth (10.12.35).

N.224 = N.110 plant 9 selfed. 69 plants in the family.

Habit, stems, and leaves (M. = *maritima* type, V. = *vulgaris* type, H. = F_1 type) : M. 0. : HM. 5 : MH. 29 : H. 21 : VH. 4 : HV. 8 : V. 0.; anthocyanin much 36 : medium 30 : little 1 ; glabrous 58 : 3 medium in

PLATE 4.

Top : N. 111 plant 5. F_1 of *S. vulgaris* × *S. maritima* (reciprocal of N. 116).
Middle : No. 110 plant 9. F_1 of *S. maritima* × *S. vulgaris*.
Bottom : N. 116 plant 17. F_1 of *S. maritima* × *S. vulgaris* (reciprocal of N. 111).

inflorescence only : 7 few in inflorescence only ; mat 51 : shining green 18. In addition, one plant had calyces shining green and the rest of the plant mat.

Inflorescence : 5 to 17 flowers, all slightly zygomorphic.

Calyx : inflated 31 : subinflated 35 ; anthocyanin much 1 : medium 63 : little 2 ; one plant shining green (rest of plants mat).

Corolla : all white ; bilobed 61 : multilobed 5, 3/4 lobing 62 : 2/3 lobing 4, anthocyanin blotch absent 66 ; petals overlap 55 : not overlap 11 ; segments overlap 13 : not overlap 53 ; scale 6 : small scale 51 : boss 9.

Sex : hermaphrodite 59 : hermaphrodite and female 3 : female 4.

Androecium : filaments purple 9 : white 51 ; anthers purple 47 : yellow-green 1.

Stigmata : purple 9 ; white 57 ; immature seeds purple 63 : white 1.

Ripe capsules : *maritima* type 7 : hybrid type 18 : *vulgaris* type 7.

Mature seeds : weak armadillo 21 : armadillo 11.

N.225 = N.110 plant 43 selfed. 68 plants in family.

Habit, stems, and leaves : M.0 : HM.1 : MH.20 : H. 45 : VH.2 : HV. 0 : V. 0 ; anthocyanin much 16 : medium 46 : little 6 ; glabrous 40 : 3 dense in inflorescence only : 12 medium in inflorescence only : 13 few in inflorescence only ; mat 66 : shining green 2.

Inflorescence : 3 to 17 flowers, all slightly zygomorphic.

Calyx : inflated 11 : subinflated 41 : cylindric 14 ; anthocyanin much 3 : medium 61 : little 2.

Corolla : all white ; bilobed 64, 3/4 lobing 59 : 2/3 lobing 5, anthocyanin blotch absent 64, petals overlap 54 : not overlap 10 ; segments overlap 1 : not overlap 63 ; scale 2 : small scale 42 : boss 20 ; poor petals 4.

Sex : hermaphrodite 45 : hermaphrodite and female 7 : female 12.

Androecium : filaments purple 49 : white 2 ; anthers purple 52.

Stigmata : purple 51 : white 13 ; immature seeds purple 65.

Ripe capsules : *maritima* type 9 : hybrid type 28 : *vulgaris* type 10.

Mature seeds : armadillo 46.

N.226 = N.110 plant 46 selfed. 37 plants in the family.

Habit, stems, and leaves : M.1 : HM. 10 : MH. 15 : H.10 : VH.1 : HV. 0 : V.0 ; anthocyanin much 2 : medium 31 : little 4 ; all entirely glabrous ; 32 mat : 5 shining green.

Inflorescence : 5 to 22 flowers, all more or less zygomorphic.

Calyx : inflated 9 : subinflated 17 : cylindric 4 : long cylindric 6 : anthocyanin medium 36.

Corolla : all white ; bilobed 36, 3/4 lobing 35 : 1/2 lobing 1, anthocyanin blotch absent 36, petals overlap 29 : not overlap 7 ; segments overlap 3 : not overlap 33, small scale 1 : boss 35 ; poor petal 1.

PLATE 5.

Top : N. 111 plant 5. F_1 of *S. vulgaris* × *S. maritima* (reciprocal of N. 116).
Middle : N. 110 plant 9. F_1 of *S. maritima* × *S. vulgaris*.
Bottom : N. 116 plant 17. F_1 of *S. maritima* × *S. vulgaris* (reciprocal of N. 111).

Sex : hermaphrodite 18 : hermaphrodite and female 2 : female 16.

Androecium : filaments purple 17 : white 3 ; anthers puple 20.

Stigmata : purple 20 : white 16 ; immature seeds purple 34 : white 1.

Ripe capsules : *maritima* type 5 : hybrid type 19 : *vulgaris* type 3.

Mature seeds : armadillo 28.

Winter condition : more or less die back but some shoots overwintered (6.2.39).

N.227 = N.110 plant 60 selfed. 43 plants in the family.

Habit, stems, and leaves : M. 0 : HM. 4 : MH. 9 : H. 15 : VH. 9 : H V. 5 : V. 0 ; anthocyanin much 7 : medium 35 ; all entirely glabrous; 38 mat : 5 shining green.

Inflorescence : 5 to 15 flowers, all more or less zygomorphic.

Calyx : inflated 20 : subinflated 9 : long cylindric 9 ; anthocyanin much 5 : medium 33.

Corolla : all white ; bilobed 38, 3/4 lobing 37 : 2/3 lobing 1 : anthocyanin blotch absent 38, petals overlapping 23 : not overlapping 15, segments overlapping 6 : not overlapping 32, small scale 1 : boss to small scale 1 : boss 36.

Sex : hermaphrodite 12 : hermaphrodite and female 4 : female 22.

Androecium : filaments purple 11 : white 5 ; anthers purple 16.

Stigmata : purple 24 : white 14 ; immature seeds purple 37 : white 1.

Ripe capsules : *maritima* type 6 : hybrid type 21 : *vulgaris* type 4.

Mature seeds : armadillo 31.

Winter condition : segregation obvious, 5 plants had overwintering barren shoots, remainder had none (6.3.39).

N.111 = N.12 plant 251 × A.70. 87 plants in the family.

Habit : as for N.110 ; all glabrous, all mat.

Leaves : as for N.110.

Inflorescence : as for N.110.

Calyx : inflated 26 : subinflated 61 ; all with medium anthocyanin.

Corolla : all white ; bilobed 10 : multilobed 2 ; 3/4 lobing 13 ; small scale 13 ; anthocyanin blotch absent 13 ; petals overlap 11 : not overlap 2 ; segments overlap 9 : not overlap 4.

Sex : hermaphrodite 12 : hermaphrodite and female 1.

Androecium : filaments purple 12 : white 1 ; anthers purple 13.

Stigmata : purple 8 : white 5 ; immature seeds purple 87.

Ripe capsules : hybrid type 87.

Mature seeds : armadillo 86.

Winter condition : mostly died down completely, some still showed a little green growth (10.12.35).

N.228 = N.111 plant 5 selfed. 26 plants in the family.

Habits, stems, and leaves : M. 2 : HM. 6 : MH. 13 : H. 2 : VH. 3 : HV. 0 : V. 0 ; anthocyanin much 9 : medium 16 : little 1 ; entirely glabrous 21 : medium in inflorescence only 1 : few in inflorescence only 2 ; all mat.

Inflorescence : 5 to 26 flowers, more or less zygomorphic 24.

Calyx : inflated 8 : subinflated 15 : cylindric 1 ; anthocyanin medium 24.

Corolla : all white ; bilobed 18 : multilobed 6, 3/4 lobing 18 : 2/3 lobing 6, anthocyanin blotch absent 24, petals overlapping 22 : not overlapping 2, segments overlapping 12 : not overlapping 12, scale 6 : small scale 6 : boss 12.

Sex : hermaphrodite 20 : hermaphrodite and female 2 : female 2.

Androecium : filaments purple 7 : white 15 ; anthers purple 21 : yellow green 1.

Stigmata : purple 16 : white 8 ; immature seeds purple 17 : white 7.

Ripe capsules : *maritima* type 2 : hybrid type 15 : *vulgaris* type 3.

Mature seeds : armadillo 19.

Winter condition : more or less die back but some shoots overwintered (6.2.39).

N.229 = N.111 plant 17 selfed. 79 plants in the family.

Habit, stems, and leaves : M. 0 : HM. 10 : MH. 11 : H. 28 : VH. 14 : HV. 15 : V. 0 ; anthocyanin much 31 : medium 38 ; 48 entirely glabrous ; lower part of stem medium indumentum 1 : few hairs 2 : glabrous 19 but of these 22 plants in the inflorescence 2 dense indumentum : 6 medium : 14 few hairs ; all mat.

Inflorescence : 3 to 18 flowers, more or less zygomorphic 67 : actimorphic 1.

Calyx : inflated 34 : subinflated 26 : long cylindric 10 ; anthocyanin much 2 : medium 65 : little 3.

Corolla : all white ; bilobed 62 : multilobed 8, 3/4 lobing 66 : 2/3 lobing 4, anthocyanin blotch absent 70, petals overlapping 65 : not overlapping 13, segments overlapping 42 : not overlapping 28, scale 4 : small scale 23 : boss 43.

Sex : hermaphrodite 66 : 1 hermaphrodite and female (one " morphological hermaphrodite " produced well formed anthers but with no pollen in them).

Androecium : filaments purple 8 : white 62 ; anthers purple 69 : yellow green 1.

Stigmata : purple 12 : white 58 ; immature seeds purple 56 : white 13.

Ripe capsules : *maritima* type 16 : hybrid type 35 : *vulgaris* type 6.

Mature seeds : armadillo 57.

Winter condition : no overwintering shoots present (12.3.40).

N.229. Showing dense indumentum on the inflorescence.

N.230 = N.111 Plant 25 selfed. 70 plants in the family.

Habit, stems, and leaves : M. 0 : HM. 1 : MH. 10 : H. 29 : VH. 23 : HV. 7 : V. 0 ; anthocyanin much 21 : medium 38 : little 1 : none 1 ; entirely glabrous 60 ; all mat.

Inflorescence : 3 to 32 flowers, all more or less zygomorphic.

Calyx : inflated 19 : subinflated 40 : long cylindric 1 ; anthocyanin much 5 : medium 55 : little 0.

Corolla : all white ; bilobed 51 : multilobed 9, 3/4 lobing 47 ; 2/3 to 3/4 lobing 2 ; 2/3 lobing 11, anthocyanin blotch absent 60, petals overlapping 52 : not overlapping 8, segments overlapping 14 : not overlapping 46, scale 13 : small scale 22 : boss 25.

Sex : hermaphrodite 42 : hermaphrodite and female 6 : female 11.

Androecium : filaments purple 4 : white 44 ; anthers purple 48.

Stigmata : purple 36 : white 24 ; immature seeds purple 47 : white 10.

Ripe capsules : *maritima* type 11 : hybrid type 30 : *vulgaris* type 7.

Mature seeds : armadillo 49.

Winter condition : 2 had few overwintering barren shoots, remainder none (12.3.40).

N.116 = A.70 × N.12 plant 251. 42 plants in the family.

Habit : as for N.110 ; all glabrous, all mat.

Leaves : as for N.110.

Inflorescence : as for N.110.

Calyx : inflated 17 : subinflated 25 ; all with medium anthocyanin.

Corolla : all white ; bilobed 4 : multilobed 2 : 3/4 lobing 6 ; small scale 6 ; anthocyanin blotch absent 6 ; petals overlap 5 : not overlap 1 ; segments overlap 4 : not overlap 2.

Sex : hermaphrodite 6.

Androecium : filaments purple 3 : white 3 ; anthers purple 6.

Stigmata : purple 4 : white 2 ; immature seeds purple 42.

Ripe capsules : hybrid type 42.

Mature seeds : armadillo 41.

Winter condition : mostly died down completely, a few showed a little green growth (10.12.35).

N.232 = N.116 plant 29 selfed. 70 plants in the family.

Habit, stems, and leaves : M. 0 : H M. 1 : M H. 3 : H. 26 : V H. 29 : H V. 11 : V. 0 ; anthocyanin much 29 : medium 25 : little 6 ; lower stems all glabrous, 39 entirely glabrous : dense in inflorescence 1 : medium in inflorescence 4 : few in inflorescence 7 ; all mat.

Inflorescence : 6 to 23 flowers, all more or less zygomorphic.

Calyx : inflated 18 : subinflated 29 : long cylindric 4 ; anthocyanin much 2 : medium 49.

Corolla : all white ; bilobed 50 : multilobed 1, 3/4 lobing 47 : 2/3 to 3/4 lobing 1 : 2/3 lobing 3, anthocyanin blotch absent 50, petals overlapping 41 : not overlapping 10, segments overlapping 9 : not overlapping 42, scale 14 : small scale 32 : boss 5.

Sex : hermaphrodite 43 : hermaphrodite and female 2 : female 6.

Androecium : filaments purple 2 : white 43 ; anthers purple 44.

Stigmata : purple 20 : white 31 ; immature seeds purple 49 : white 2.

Ripe capsules : *maritima* type 15 : hybrid type 21 : *vulgaris* type 2.

Mature seeds : armadillo 38.

Winter condition : 6 had few overwintering barren shoots, remainder had none (12.3.40).

N.233 = N. 116 plant 17 selfed. 70 plants in the family.

Habit, stems, and leaves : M. 0 : H M. 0 : M H. 18 : H. 30 : V H. 17 : H V. 5 : V. 0 ; anthocyanin much 13 : medium 34 : little 4 ; entirely glabrous 44 ; all mat.

Inflorescence : 3 to 21 flowers, all more or less zygomorphic.

Calyx : inflated 5 : subinflated 22 : long cylindric 16 ; anthocyanin much 8 : medium 35.

Corolla : all white ; bilobed 36 : multilobed 8, 3/4 lobing 38 : 2/3 lobing 5 : 1/2–2/3 lobing 1, anthocyanin blotch present 6 : absent 38, petals overlapping 23 : not overlapping 21, segments overlapping 9 : not overlapping 35, scale 6 : small scale 14 : boss 24.

Sex : hermaphrodite 28 : hermaphrodite and female 5 : female 11.

Androecium : filaments purple 8 : white 24 ; anthers purple 32.

Stigmata : purple 38 : white 6 ; immature seeds purple 40 : white 2.

Ripe capsules : *maritima* type 2 : hybrid type 31 : *vulgaris* type 6.

Mature seeds : armadillo 39.

Winter condition : 3 had few overwintering barren shoots, remainder had none (12.3.40).

Discussion

Habit characters have been scored into 7 groups ranging from *maritima* (M.) through the F_1 hybrid (H.) to *vulgaris* (V.). The summation of F_2 families gives :

M. 3 : HM. 38 : MH. 128 : H. 206 : VH. 102 : HV. 51 : V. 0.

Thus only 3 plants resembling the *S. maritima* grandparent and none resembling the *S. vulgaris* grandparent appeared in 528 F_2 plants.

The F_1 families had plants which either died down completely or showed a few green shoots near the bases of the old stems. In N.110, 25, in N.111, 20, and in N.116, 4 plants showed some green in mid-winter. The F_2 families consisted of a majority of plants which died down completely with a few which retained some over-wintering green shoots.

Surface. A.70 and N.12 plant 251 were mat and N.12 plant 172 was shining green. All plants in all families derived from crosses between A.70 and N.12 plant 251 were mat. The F_1 of A.70 × N.12 plant 172 gave only mat plants. In F_2 there was the following segregation :

N.224	mat 51	shining green 18
N.225	mat 66	shining green 2
N.226	mat 32	shining green 5
N.227	mat 38	shining green 5
Totals :	mat 187	shining green 30

Indumentum. An entirely new character was observed in some plants of F_2 families dealt with in this paper. *S. maritima* is always, in our experience, entirely glabrous, apart from some leaf ciliations. *S. vulgaris*

may be entirely glabrous or may have indumentum developed in greater or less degree on the vegetative part of the stem and leaves, the inflorescemce branches and pedicels being glabrous. The F_1 families N.110, N.111 and N.116 were fully scored for indumentum on vegetative parts. In scoring F_2 families the presence of hairs on inflorescence branches, and especially pedicels, was noticed and all plants were then scored for this character in addition to being scored for indumentum in vegetative parts. The preserved samples of F_1 plants were entirely glabrous. The grandparents had glabrous inflorescences.

All plants in four F_2 families were entirely glabrous. In the other five F_2 families there was segregation for indumentum (presence or absence and if present degree of development in the inflorescence). The figures were :

	Dense	Medium	Few	Glabrous
N.224 ...	0	3	7	58
N.225 ...	3	12	13	40
N.228 ...	0	1	2	21
N.229 ...	2	6	14	48
N.232 ...	1	4	7	39
Totals : ...	6	26	43	206

75 with hairs : 206 glabrous.

Families N.226, N.227, N.230, N.233 had no hairs in the inflorescence or in the vegetative parts.

In all families (F_1 and F_2) the vegetative parts of all plants were glabrous except in three plants in N.229, of which 1 had medium indumentum and 2 few hairs. These three plants had hairs in the inflorescence.

Calyx shape. A.70 had long cylindric calyces while N.12 plants 172 and 251 had inflated calyces and all three bred true to these shapes.

In F_1 no cylindric or long cylindric calyces occurred. The figures obtained were :

	Inflated	Subinflated
N.110 ...	25	58
N.111 ...	26	61
N.116 ...	17	25
Totals	68	144

In F_2, either cylindric or long clylindric calyces occurred in every family except in N.224. Where the immediate parent had inflated calyces relatively more offspring had inflated calyces than where the immediate parent had subinflated calyces, the proportions of inflated to subinflated being 1 : 1·2 and 1 : 2·9 respectively. The F_2 families from parents with inflated calyces gave the summated ratios : inflated 122 : subinflated 149 : cylindric 0 : long cylindric 24 ; from parents with subinflated calyces the summated ratios were : inflated 33 : subinflated 95 :

Number of flowers per inflorescence in F_2 families.

Family ...	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	29	32
N.224 ...		4		46	2	3				6		3		2											
N.225 ...	1	4		41	3	5		6		4		1		1											
N.226 ...		2	1	5	4	5	1	3	2	2	2	7							1						
N.227 ...		2	1	16	6	2	1	2	1	1	2	5													
N.228 ...		1		8		2	1	1	2		2	3	1			1	1						1		
N.229 ...	1	6	1	25	4	4	3	1	6	5	5	7			1										
N.230 ...	1	1		22	2	3	2	3	2	2	7	8		2							1	2		1	1
N.232 ...			2	14	4	1	2	1	2	4	4	9	1		3			2		1					
N.233 ...	1	3		23	1	3	2	1	3	1	2	4						1							
Totals ...	4	23	5	200	26	28	12	18	18	25	24	47	2	5	4	1	1	3	1	1	1	2	1	1	1

All the flowers were more or less zygomorphic. In 212 F_1 and 532 F_2 plants no actinomorphic flowers appeared.

cylindric 19 : long cylindric 22. Except in N.226, no family gave both cylindric and long cylindric. The results of the reciprocal crosses (N.111 and N.116) suggest that factors in the cytoplasm do not directly influence calyx shape in the families dealt with here :

Mature capsules. In N.110, N.11, and N.116 there was a straight cross between plants with *S. maritima* and *S. vulgaris* capsules. In the F_1 families all the plants had intermediate capsules except two plants in N.110 which were phenotypically of *maritima* type. The summated F_2 figures were :

maritima type 73 : F_1 type 218 : *vulgaris* type 48.

There was considerable sterility in N.224 and N.225, though rather less in the latter than in the former.

Mature seeds. All plants used in breeding, except N.12 plant 172 and N.110 plant 9 had armadillo seeds and there was true breeding for this character in all families except N.110 and N.224 which had one parent with weak armadillo seeds. This is in accordance with the recessive nature of armadillo. In N.110, the result of crossing armadillo with weak armadillo, the figures obtained were weak armadillo 33 : armadillo 48. In N.224 (F_2) the immediate F_1 parent had weak armadillo seeds and the selfing gave weak armadillo 21 : armadillo 11.

Summary.

In this paper the results are given of three crosses (two of them reciprocal) between a plant of *S. maritima* peculiar in having long cylindric calyces and two plants of *S. vulgaris*.

It is shown how very rarely either grand-parental habit reappears in F_2. Shining green in *S. vulgaris* N.12 plant 172 is recessive to mat in *S. maritima* A.70. A new kind of indumentum distribution, with three grades of density, is recorded, in which hairs appeared in the inflorescence in five F_2 families. The number of flowers per inflorescence in F_2 families shows a very marked mode at 7 flowers per inflorescence. The long cylindric calyx did not occur in F_1 families but either cylindric or long cylindric segregated in every F_2 family. The influence of the genotype with inflated calyces was obvious in F_2 families which had an F_1 parent with inflated calyces. The results from reciprocal crosses suggest that calyx shape is not directly influenced by cytoplasmic factors. Plants with armadillo seeds again bred true to this character. Plants with weak armadillo seeds segregated from armadillo and weak armadillo.

The research on which this paper is based has been aided by a Royal Society Government Grant.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXX.

E. M. Marsden-Jones and W. B. Turrill.

Crosses involving plants from the shore of Loch Tay.

In *K.B.* 1940, 66–73, we described plants from Fearnan, Loch Tay, Scotland, and selfings of stock plants derived from the population. The present paper deals with crosses made between these selected stock plants and *S. maritima* and *S. vulgaris* of another origin.

The families dealt with in this paper are :

N.123 = N.36 plant 8 × B.37 (30 plants).
N.238 = N.123 plant 5 selfed (46 plants).
N.249 = N.123 plant 10 selfed (58 plants).
N.250 = N.123 plant 8 selfed (25 plants).
N.251 = N.123 plant 6 selfed (23 plants).

N.124 = N.36 plant 5 × B.38 (28 plants).
N.236 = N.124 plant 2 selfed (60 plants).

N.126 = A.70 × B.37 (31 plants).
N.246 = N.126 plant 6 selfed (20 plants).
N.247 = N.126 plant 12 selfed (27 plants).
N.248 = N.126 plant 13 selfed (39 plants).
N.240 = N.126 plant 31 selfed (70 plants).
N.241 = N.126 plant 19 selfed (11 plants).
N.243 = N.126 plant 25 selfed (70 plants).

N.125 = N.12 plant 251 × B.39 (87 plants).
N.284 = N.125 plant 4 selfed (18 plants).
N.318 = N.125 plant 5 selfed (25 plants).
N.319 = N.125 plant 36 selfed (18 plants).

Essential characters of plants used in breeding.

N.36 plant 8 (= A.2 × A.13) had cylindric calyx, petals white, petals and segments overlap, 3/4 lobing, scale, blotch present, hermaphrodite, filaments white, anthers purple, stigmata purple, immature seeds purple, capsules of *maritima* type broadly ovoid, seeds armadillo.

N.36 plant 5 (= A.2 × A.13) had cylindric to broadly ellipsoid calyx, petals white, petals and segments overlap, 3/4 lobing, scale, blotch absent, hermaphrodite and female, filaments purple, stigmata purple, immature seeds purple, capsules of *maritima* type obloid, seeds armadillo.

For a description of the family N.36 see *K.B.* 1939, 294.

A.70 was described in *K.B.* 1939, 298.

B.37, B.38, and B.39 were described in *K.B.* 1940, 67–68.

N.12 plant 251 (see *K.B.* 1935, 216).

N.123 plant 5 had subinflated calyx, medium anthocyanin, petals pale colour, petals and segments not overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite and female, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate between *maritima* and *vulgaris*, seeds tubercled.

N.123 plant 10 had subinflated calyx, medium anthocyanin, petals white, petals not overlapping, segments overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite and female, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds tubercled.

N.123 plant 8 had subinflated calyx, medium anthocyanin, petals medium colour, petals not overlapping, segments overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds armadillo.

N.123 plant 6 had cylindric calyx, medium anthocyanin, petals deep colour, petals not overlapping, segments overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite and female, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds armadillo.

N.124 plant 2 had subinflated calyx, medium anthocyanin, petals white, petals not overlapping, segments overlapping, 3/4 lobing, small scale, blotch absent, hermaphrodite and female, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds armadillo.

N.125 plant 4 had inflated calyx, medium anthocyanin, petals pale colour, petals and segments not overlapping, 3/4 lobing, small scale, blotch absent, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds white, capsules *vulgaris* type, seeds armadillo.

N.125 plant 5 had inflated calyx, medium anthocyanin, petals pale colour, petals and segments not overlapping, 3/4 lobing, small scale, blotch absent, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds white, capsules *vulgaris* type, seeds armadillo.

N.125 plant 36 had inflated calyx, medium anthocyanin, petals medium colour, petals and segments not overlapping, 3/4 lobing, small scale, blotch absent, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds white, capsules *vulgaris* type, seeds armadillo.

N.126 plant 6 had subinflated calyx, medium anthocyanin, petals medium colour, petals and segments overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules *vulgaris* type, seeds armadillo.

N.126 plant 12 had inflated calyx, much anthocyanin, petals deep colour, petals overlapping, segments not overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds tubercled.

N.126 plant 13 had subinflated calyx, medium anthocyanin, petals white, petals and segments not overlapping, 3/4 lobing, small scale, blotch absent, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds tubercled.

N.126 plant 19 had subinflated calyx, medium anthocyanin, petals medium colour, petals and segments overlapping, 3/4 lobing, small scale, blotch absent, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds tubercled.

N.126 plant 25 had subinflated calyx, much anthocyanin, petals deep colour, petals and segments overlap, 3/4 lobing, small scale, blotch present, hermaphrodite and female, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds tubercled.

N.126 plant 31 had subinflated calyx, much anthocyanin, petal colour uncertain, petals overlapping, segments not overlapping, 3/4 lobing, small scale, blotch present, hermaphrodite, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules intermediate, seeds armadillo.

Descriptions of F_1 families.

N.123 = N.36 plant 8 × B.37. 30 plants in the family.

Habit : intermediate between parents ; up to 4·5 dm. tall ; anthocyanin in vegetative parts medium ; glabrous.

Flowers : up to 17 per inflorescence ; slightly zygomorphic.

Calyx : inflated 1 : subinflated 27 : cylindric 1 ; anthocyanin much 11 : medium 18.

Corolla : petals overlapping 8 : not overlapping 20 ; segments overlapping 24 : not overlapping 4 ; bilobed 29 ; 3/4 lobing 29 ; small scale 29 ; blotch present 14 : absent 15 ; colour deep 4 : medium 10 : pale 2 : white 13.

Androecium : filaments purple 15 ; anthers purple 15 ; hermaphrodite 5 : hermaphrodite and female 10 : female 14.

Gynoecium : stigmata purple 28 : white 1 ; immature seeds purple 29.

Fruits : intermediate 29.

Seeds : tubercled 17 : armadillo 13.

N.124 = N.36 plant 5 × B.38. 28 plants in the family.

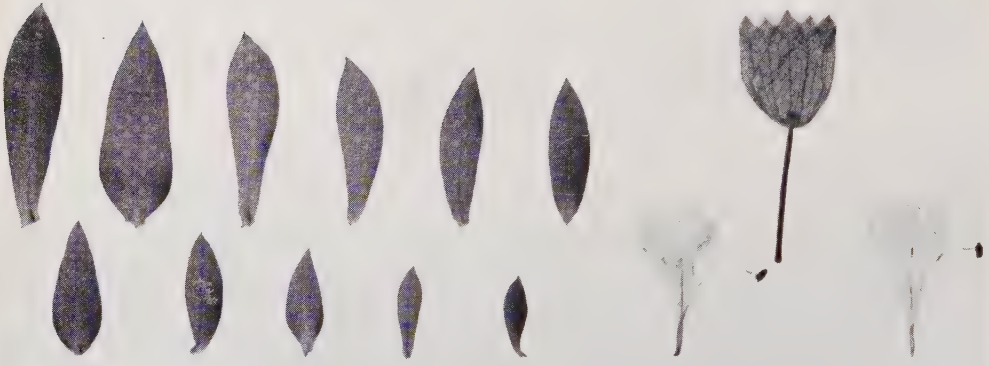
Habit : intermediate between parents ; up to 5·0 dm. tall ; anthocyanin in vegetative parts medium ; glabrous.

Flowers : up to 15 per inflorescence ; slightly zygomorphic.

Calyx : inflated 3 : subinflated 25 ; anthocyanin much 11 : medium 17.

PLATE 6.

Top : N. 124 plant 20. F_1 of *S. maritima* × *S. vulgaris*.
Middle : N. 123 plant 8. F_1 of *S. maritima* × *S. vulgaris*.
Bottom : N. 126 plant 25. F_1 of *S. maritima* × *S. vulgaris*.



Corolla : petals overlapping 15 : not overlapping 13 ; segments overlapping 9 : not overlapping 19 ; bilobed 29 ; 3/4 lobing 28 ; small scale 29 ; blotch present 13 : absent 15 ; colour medium 9 : pale 9 : white 10.

Androecium : filaments purple 12 : white 1 ; anthers 13 purple ; hermaphrodite 1 : hermaphrodite and female 12 : female 15.

Gynoecium : stigmata purple 27 : white 1 ; immature seeds purple 28.

Fruits : intermediate 26 : *maritima* type 2.

Seeds : armadillo 26.

N.125 = N.12 plant 251 × B.39. 87 plants in the family.

Habit : *vulgaris* type ; up to 7·5 dm. tall ; anthocyanin in vegetative parts much 80 : medium 7 ; glabrous.

Flowers : up to 60 ; zygomorphic.

Calyx : inflated 72 ; anthocyanin medium 54 ; little 18.

Corolla : petals and segments not overlapping 72 ; bilobed 72 : 3/4 lobing 72 ; small scale 72 ; blotch present 1 : absent 71 ; colour medium 10 : pale 29 : white 42.

Androecium : filaments purple 71 : white 1 ; anthers purple 72 ; hermaphrodite 72.

Gynoecium : stigmata purple 66 : white 6 ; immature seeds white 54.

Fruits : *vulgaris* type 51.

Seeds : armadillo 51.

17 plants were badly attacked by *Ustilago*.

N.126 = A.70 × B.37. 31 plants in the family.

Habit : intermediate between parents ; up to 5·5 dm. tall ; anthocyanin in vegetative parts medium ; glabrous.

Flowers : up to 22 ; slightly zygomorphic.

Calyx : inflated 4 : subinflated 27 ; anthocyanin much 10 : medium 21.

Corolla : petals overlapping 28 : not overlapping 3 ; segments overlapping 18 : not overlapping 13 ; 30 bilobed : 1 multilobed ; 3/4 lobing 31 ; small scale 31 ; blotch present 11 : absent 19 ; colour deep 4 : medium 8 : white 19.

Androecium : filaments purple 30 ; anthers purple 30 ; hermaphrodite 13 : hermaphrodite and female 17 : female 1.

Gynoecium : stigmata purple 30 : white 1 ; immature seeds purple 26.

Fruits : *vulgaris*-type 2 : intermediate 29.

Seeds : tubercled 14 : armadillo 16.

PLATE 7.

Top : N. 124 plant 20. F_1 of *S. maritima* × *S. vulgaris*.
Middle : N. 123 plant 8. F_1 of *S. maritima* × *S. vulgaris*.
Bottom : N. 126 plant 25. F_1 of *S. maritima* × *S. vulgaris*.

Tabulations of characters in F_2 families.

Family	Habit							Corona			Petal Colour			
	V	HV	VH	H	MH	HM	M	S	Sm.S.	B	D	M	P	W
N.238 ...	0	0	0	20	14	7	5	2	10	10	0	1	14	17
N.249 ...	0	2	8	13	31	4	0	5	22	30	0	0	0	58
N.250 ...	1	0	2	13	7	2	0	0	6	19	1	5	15	4
N.251 ...	0	1	2	12	5	3	0	7	5	11	0	12	0	11
N.236 ...	0	0	0	2	57	1	0	4	14	38	0	0	0	56
N.246 ...	0	0	4	9	4	3	0	1	4	9	0	0	0	14
N.247 ...	0	0	2	19	5	1	0	0	2	19	0	9	5	7
N.248 ...	0	0	3	17	17	2	0	0	1	28	0	0	0	29
N.240 ...	0	4	1	53	10	0	0	4	28	33	5	11	14	36
N.241 ...	0	1	1	7	2	0	0	0	3	5	0	0	1	7
N.243 ...	0	1	6	35	24	4	0	3	4	25	12	4	1	15
N.284 ...	18	0	0	0	0	0	0	0	15	2	0	0	14	3
N.318 ...	25	0	0	0	0	0	0	0	21	4	0	0	21	4
N.319 ...	18	0	0	0	0	0	0	0	14	4	0	0	15	3

Number of flowers per inflorescence.

Family ...	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	31
N.238 ...	4		5		27		2	1		1	4																
N.249 ...	1		3		40		4	3	1	1	3	2															
N.250 ...					11	2			1	1	2	2	1			2		1					1			1	
N.251 ...			1		5	3	1	2	3	4	2	1		1													
N.236 ...	1	1	1		19	3	5	2	1	6	1	4	1	1	4	1				1		2			1	1	
N.246 ...	1				4		2	1		1		1	2		2		1										
N.247 ...			2	1	7	2		3		1	1	1			1	1	1										
N.248 ...	2			3	11	5	2	1	2	1	2	1	1														
N.240 ...					12	8	7	3	7	9	3	5	3	2	3	1	1	1	1					2			1
N.241 ...					6				1		1																
N.243 ...	3	2	2		10	3	5	2	1		1					1		1			1						
Totals ...	12	3	14	4	152	26	28	18	17	25	20	17	8	4	10	6	3	3	1	1	1	2	1	2	1	2	1

Number of flowers per inflorescence.

Family ...	12	13	21	27	28	29	30	31	32	34	35	36	37	38	39	40	41	44	46	47	48	49	52	54	55	57	58	59	61	65	67	68	71	84	86	90	93	96
N.284 ...	2	2				1			1			1		1				1				2	1		1			1			1	1						
N.318 ...	1						2			1			1	2	1	2			3	1	2			1				1	1	1		1		1	1	1		1
N.319 ...			1	1	1		1	1			2	1	1		1		1					2		1		1	1					1				1		
Totals ...	3	2	1	1	1	1	3	1	1	1	2	2	2	3	2	2	1	1	3	1	2	4	1	2	1	1	1	2	1	1	1	2	1	1	1	1	1	1

Family ...	Anthocyanin in vegetative parts					Calyx shape				Anthocyanin in calyx				
	V Mu	Mu	M	L	N	I	S	C	LC	V Mu	Mu	M	L	N
N.238 ...	0	2	24	17	1	0	26	17	0	0	0	38	4	1
N.249 ...	0	1	48	6	3	12	43	3	0	0	0	53	5	0
N.250 ...	0	6	17	2	0	2	15	8	0	0	0	22	3	0
N.251 ...	0	2	11	8	2	3	16	3	0	0	2	12	8	1
N.236 ...	0	1	33	8	14	8	45	3	0	0	0	42	11	3
N.246 ...	0	1	7	8	0	1	13	0	1	0	0	14	1	0
N.247 ...	0	1	21	0	0	7	9	1	4	0	2	18	1	0
N.248 ...	0	10	17	7	0	3	17	0	9	0	6	22	1	0
N.240 ...	0	19	42	4	0	15	44	0	6	0	17	45	2	1
N.241 ...	0	3	3	2	0	0	6	0	2	0	2	4	2	0
N.243 ...	0	10	16	7	0	2	21	4	5	0	4	28	0	0
N.284 ...	0	5	13	0	0	1	16	0	0	0	0	17	0	0
N.318 ...	0	6	19	0	0	3	22	0	0	0	1	24	0	0
N.319 ...	0	3	15	0	0	8	10	0	0	0	0	18	0	0

Family	Lobing		Depth of lobing			Develop-ment		Petals overlap		Segments overlap		Blotch		Sex		
	B	M	2/3	3/4	1/2	Full	Poor	O	NO	O	NO	P	A	H	HF	F
N.238 ...	33	2	8	25	2	24	20	2	33	4	31	2	15	14	3	22
N.249 ...	57	0	10	47	0	43	15	6	51	12	45	42	15	43	2	12
N.250 ...	25	0	4	17	4	18	7	0	24	10	14	—	—	14	5	6
N.251 ...	22	0	3	20	0	23	0	2	21	11	12	0	11	9	4	8
N.236 ...	55	1	0	56	0	56	0	24	32	4	52	2	54	29	4	23
N.246 ...	14	0	2	10	2	11	3	4	10	0	14	1	13	12	1	1
N.247 ...	21	0	0	21	0	21	0	0	21	0	21	0	7	12	2	7
N.248 ...	28	1	1	28	0	29	0	2	27	0	29	0	29	10	3	16
N.240 ...	60	4	2	62	0	64	0	14	51	5	61	17	40	48	5	12
N.241 ...	8	0	0	8	0	8	0	2	6	1	7	1	7	6	2	0
N.243 ...	32	0	0	32	0	32	0	14	18	0	32	9	18	16	4	12
N.284 ...	17	0	0	17	0	17	0	0	17	0	17	6	11	9	4	4
N.318 ...	25	0	0	25	0	25	0	0	25	0	25	20	5	23	0	2
N.319 ...	18	0	0	18	0	18	0	0	18	0	18	13	5	15	2	1

Family	Anthocyanin in: Anthers P	Anthers YG	Filaments P	Filaments W	Stigmata P	Stigmata W	Immature seeds P	Immature seeds W	Fruits V	Fruits H	Fruits M	Seeds T	Seeds A
N.238 ...	17	0	8	9	27	15	36	2	2	13	2	11	7
N.249 ...	44	1	23	22	29	29	53	3	1	9	2	6	4
N.250 ...	19	0	19	0	25	0	23	2	1	7	0	0	9
N.251 ...	13	0	5	8	8	14	21	2	0	5	0	0	5
N.236 ...	33	0	9	24	11	45	50	6	5	20	4	0	26
N.246 ...	13	0	6	7	9	5	14	1	4	8	0	0	12
N.247 ...	14	0	12	2	14	5	19	1	1	10	3	7	6
N.248 ...	13	0	3	10	26	3	28	0	3	17	2	9	9
N.240 ...	53	0	48	5	38	27	54	9	7	43	4	0	50
N.241 ...	8	0	3	5	6	2	8	0	0	4	0	2	1
N.243 ...	20	0	14	6	13	19	28	3	3	21	2	17	9
N.284 ...	12	1	10	3	11	5	0	15	14	0	0	0	14
N.318 ..	23	0	2	21	17	8	0	25	20	0	0	0	19
N.319 ...	16	1	7	10	12	6	0	18	15	0	0	0	15

Discussion

Habit. N.125 and the families derived from it bred true to *vulgaris* type of habit. N.123, N.124, N.126, derived from a cross between *S. vulgaris* and *S. maritima* had a habit intermediate between that of *S. vulgaris* and *S. maritima.* The summation of the F_2 families from plants of these three F_1 families gave :

V. 1 : HV.9 : VH.29 : H.200 : MH.176 : HM.27 : M.5.

Out of 447 plants only 6 gave the full combination of characters for habit shown by the grandparents.

All pure *S. vulgaris* families die down completely in the winter, showing no over-wintering barren shoots. The F_1 families of interspecific origin had plants mostly intermediate, with incomplete die-back of aerial parts, while the corresponding F_2 families showed either complete die-back (an *S. vulgaris* character) or segregation with die-back predominant.

Anthocyanin in vegetative parts and calyx. No plants had very much anthocyanin and only in plants from N.123 were there plants with no anthocyanin in vegetative parts and/or in calyces, except for one plant in N.240 with none in the calyces. The vast majority of plants had either much or medium anthocyanin in both vegetative parts and calyces.

Indumentum. All plants of all F_1 and F_2 families were glabrous. Hairy individuals were expected in N.125 but none appeared. We know that N.12 plant 251 was heterozygous for hairiness versus the glabrous condition. It may be suggested that B.39 was homozygous for the recessive (h) of a gene (H) needed for development of hairs and for a gene inhibiting hairs. This would give the scheme :

	Hhii × hhII
	↓
F_1	HhIi + hhIi
	↓
F_2	hhII + hhIi + hhii

Number of flowers per inflorescence.

In F_2 families involving only *S. vulgaris* the very wide scatter through classes from 12 to 96 flowers per inflorescence is remarkable. In F_2 families from the inter-specific crosses the major mode is at 7 indicating a strong influence of *S. maritima.*

Zygomorphy. Purely *S. vulgaris* families showed full zygomorphy of the flowers. The F_1 families of the interspecific crosses had in all plants slightly zygomorphic flowers. In the F_2 families all flowers were more or less zygomorphic, that is, no plants had the actinomorphic flowers of pure *S. maritima.*

Petal colour. All F_1 families segregated for colour. The F_2 families N.249, N.248, and N.236 derived from F_1 plants with white flowers had all only white flowered offspring. N.246, derived from the selfing of an F_1 plant with medium coloured flowers also had only white flowered plants. All other F_2 families were derived from plants with coloured

flowers and segregated for coloured and white flowers, except that the scoring for flower colour of the immediate parent of N.240 was uncertain.

Corona. All F_1 plants had small scales. Every F_2 family had flowers with bosses in some plants and either small scales or scales in other plants.

Lobing of petals. The pure *S. vulgaris* families had only bilobed petals with 3/4 lobing. In F_2 families from the interspecific crosses 8 plants had some multilobed petals. Four of these families had only 3/4 lobed petals, 7 families segregated for 3/4 and 2/3 lobed petals and 3 families for 1/2 lobed petals.

Poor petal. Three families derived from N.36 plant 8 (one of whose parents had poor petals) had 42 plants with poor petals and 85 with fully developed petals. Three plants with poor petals also appeared in N.246.

Overlapping. The pure *S. vulgaris* families had only plants with both petals and segments not overlapping. All F_2 families, except N.247, from interspecific crosses showed segregation for overlapping versus non-overlapping of either petals or segments or both. Overlapping was introduced through *S. maritima* grandparents.

Petal blotch. All F_1 and all F_2 families except N.251, N.247, and N.258 segregated for presence and absence of blotch.

Sex. Every F_1 family except N.125 (with only hermaphrodite flowers) and every F_2 family segregated for sex.

Anthocyanin in floral parts. All F_2 families had purple anthers except one plant with yellow-green anthers in every one of three families. Filaments segregated for purple versus white in all except two F_2 families and stigmata in all except one. The pure *S. vulgaris* families had all plants with white seeds. All F_1 families from interspecific crosses had purple seeds only but all F_2 families from them segregated for immature seed colour except N.248 and N.241. The summated F_2 ratio is 335 purple : 19 white which suggests a dihybrid ration with only the double recessive without colour.

Fruits. The pure *S. vulgaris* families had only *vulgaris* type capsules. All F_2 families from interspecific crosses segregated for fruit shape, except N.251 and N.241, in which the few scorable fruits were of intermediate type only. The summated ratio was *vulgaris* type 27 : intermediate type 157 : *maritima* type 19.

Seeds. The pure *S. vulgaris* families had only armadillo seeds. In the two F_1 families produced by interspecific crossing with B.37 as one parent the tubercled seed character was dominant over the armadillo seed character. In the corresponding F_2 families segregation occurred in the ration 52 tubercled : 36 armadillo. This has to be interpreted as a 3 : 1 ration distorted by the sterility of many plants.

Sterility. F_1 families showed no unusual sterility, average numbers of capsules and seeds set. In F_2 families from interspecific crosses there was marked to very considerable sterility and many plants could not be scored for fruit or seed characters.

Summary.

Crosses were made between *S. vulgaris* plants from near Loch Tay and both *S. maritima* and *S. vulgaris* plants of different origin. In families of intraspecific origin the specific characters of *S. vulgaris* remained constant in both F_1 and F_2 families. In families of interspecific origin there was segregation, mostly of a complicated type, for the specific characters of *S. vulgaris* and *S. maritima*, usually with failure of dominance. An unexpected type of behaviour for indumentum inheritance can be explained by presence of inhibitors for hairs in one parent. Segregation for flower colour, which was introduced with *S. vulgaris* parents, occurred in most families. Armadillo seeds are recessive to tubercled seeds in both interspecific and intraspecific (*S. vulgaris*) crosses and armadillo-seeded plants, of whatever origin bred true to this character. F_2 families from interspecific crosses showed a high degree of sterility.

The research on which this paper is based has been aided by a Royal Society Government Grant.

NEW PLANT NAMES FROM INDIA

Cissus woodrowii (*Stapf*) *Santapau*, comb. nov. *Vitis Woodrowii* Stapf ex Cooke, in Fl. Pres. Bomb. **1,** 248, 1902. *Cissus vitiginea* Dalz. & Gibs., Bomb. Fl. 40, 1861 (non Roxb.).

Asystasia dalzelliana *Santapau*, nom. nov. *Asystasia violacea* Dalz., MS. ex Clarke in Hook. f., Fl. Brit. Ind. **4** : 494, 1884 (non Dalz. in Kew Journ. Bot. **2** : 139, 1850). *Asystasia coromandeliana* Bot. Mag., t. 5248 (non Wight, 1832).

Phaulopsis dorsiflora (*Retz.*) *Santapau*, comb. nov. *Ruellia imbricata* Forsk., Fl. Aeg.-Arab. 113, 1775. *Ruellia dorsiflora* Retz., Obs. **6** : 31, 1791. *Micranthus oppositifolius* Wendl., Bot. Beobacht. 39, 1798. *Phaulopsis* (*Phaylopsis*) *parviflora* Willd., Sp. Pl. **3** : 342, 1801. *Phaulopsi imbricata* Cordem., Fl. Ile Réun. 496, 1895 (non Sweet, 1827). *Micranthus dorsiflorus* Fischer, in Kew Bull. 1932 : 63, 1932.

Syzygium phillyraeoides (*Trim.*) *Santapau*, comb. nov. *Eugenia phillyraeoides* Trim., in Journ. Bot. **23** : 207, 1885. *Eugenia Mooniana* Wight, Illustr. **2** : 13, 1850 (non Gardn., 1843).

Phaseolus khandallensis *Santapau*, nom. nov. *Phaseolus grandis* Dalz. in Dalz. & Gibs., Bomb. Fl. 72, 1861 (non Wall., nec Benth.).

Desmodium triangulare (*Retz.*) *Santapau*, comb. nov. *Hedysarum triangulare* Retz., Obs. **3** : 40, 1783. *Hedysarum Cephalotes* Roxb., Hort. Beng. 57, 1814 & Fl. Ind. **3** : 360, 1832. *Desmodium Cephalotes* Wall., Cat. 5731–5732, 1831–1832.

Desmodium triangulare var. **congestum** (*Prain*) *Santapau*, comb. nov. *D. Cephalotes* var. *congestum* Prain, in Journ. As. Soc. Beng. 66 : 389, 1898.

H. Santapau.

SCANNED

AFRICAN ORCHIDS : XVIII*

V. S. Summerhayes.

The present contribution deals entirely with Angraecoid Orchids, the main part being a revision of the genus *Tridactyle* Schltr. in which 12 new species are described. The sub-genus *Nephrangis* Schltr. of this genus is raised to generic rank under the same name, while two new sections in the genus *Cyrtorchis* are proposed and characterised. There are also a few new combinations, etc., in other genera, mostly arising from work on the genera already mentioned. The type specimens of all the new species are in the Kew Herbarium.

Rhipidoglossum erecto-calcaratum (*De Wildem.*) *Summerhayes*, comb. nov.

Angraecum erecto-calcaratum De Wildem. in Bull. Jard. Bot. Brux. **5,** 186 (1916).

Tridactyle erecto-calcarata (De Wildem.) Schltr. in Beih. Bot. Centralbl. **36,** ii. 144 (1918).

It is difficult to see on what grounds Schlechter placed this species in the genus *Tridactyle* in his account of the Angraecoid Orchids, apart from De Wildeman's suggested relationship with *Angraecum lepidotum* Rchb.f. ex Rolfe.

From De Wildeman's description the plant seemed obviously to be either a *Rhipidoglossum* or a *Diaphananthe* with the almost orbicular petals suggesting the former. Examination of the type specimen (*Seret* 1004) confirms this view, the species being closely allied to *R. rutilum* (Rchb.f.) Schltr. from which it differs in the slightly differently shaped leaves, the short dense inflorescence and the long spur. In general floral structure, including the column and the two pollinaria, the species is a typical *Rhipidoglossum*. I must add that I fail to see any resemblance between it and *Angraecum lepidotum* and cannot understand De Wildeman's comparison with this latter species.

Calyptrochilum christyanum (*Rchb.f.*) *Summerh.* in Hutch. & Dalz. Fl. West Trop. Afr. **2,** 450 (1936).

Angraecum mombasense Rolfe in Dyer, Fl. Trop. Afr. **7,** 145 (1897).
Calyptrochilum mombasense (Rolfe) Schltr. in Beih. Bot. Centralbl. **36,** ii. 85 (1918).

Rolfe separates his *Angraecum mombasense* from *A. moloneyi* Rolfe (already reduced by me to *C. christyanum*) on the relative lengths of the lip and the spur, but examination of many specimens shows that this is variable. In all essential features *A. mombasense* agrees with the widely spread *C. christyanum*, which is found in all the wooded savannah areas around the Congo Basin from Sierra Leone through Nigeria, Uganda, Northern Rhodesia to Angola. It is probable that the type of *A. mombasense* came from somewhere in the interior of East Africa, not from the Mombasa region.

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* Continued from K.B., 1947, 133 (1948).

Angraecum foxii *Summerhayes*, nom. nov.

A. viride (Ridl.) Schltr. in Beih. Bot. Centralbl. **33**, ii. 438 (1915), non *A. viride* Kraenzl. (1914).

Mystacidium viride Ridl. in Journ. Linn. Soc. Lond. Bot. **22,** 122 (1886).

Schlechter made the combination *Angraecum viride*, based on *Mystacidium viride* Ridl., in 1915 when dealing only with Mascarene Island orchids and apparently overlooked the earlier West African *A. viride* of Kraenzlin. When, however, he revised the whole genus *Angraecum* in 1918 (Beih. Bot. Centralbl. **36,** ii. 155–176) he quite incorrectly retained the name for the Madagascar plant and proposed a new name, *Angraecum braunii*, for the West African species.

The name *A. viride* must, of course, be retained for the latter so I am proposing the new name *A. foxii* for the Madagascar plant in honour of the original collector of the species. Perrier de la Bathie (Humbert, Fl. Madag. Orchid. **2,** 217 : 1941) places the species in section *Boryangraecum*.

Cyrtorchis Schltr.

In my key to the species of the genus *Cyrtorchis* in the Flora of West Tropical Africa (**2,** 457, 460 : 1936) I divided the species into two groups based on the nature of the viscidium. Examination of most of the other species of the genus confirms that this character is of fundamental importance and I am therefore creating two sections based on this distinction. It should be pointed out that with it are associated differences in facies and in other minor characters. A short synopsis is given below :—

Cyrtorchis *Schltr.* Die Orchideen, 595–6 (1914), et in Beih. Bot. Centralbl. **36,** ii. 127–133 (1918).

Species leptotypica.—*C. arcuata* (Lindl.) Schltr.

Schlechter does not mention in either of the above references which species he considers to be the type of the genus but in view of his opening remark in *Die Orchideen* and all the other evidence it seems most suitable to select *C. arcuata* as the Type Species.

Sectio 1. **Homocolleticon** *Summerhayes*, sect. nov. Viscidium lineare vel ligulatum, planum, omnino tenue et subhyalinum.

Species typica sectionis.—*C. monteirae* (Rchb.f.) Schltr.

This section contains about 10 species including *C. bistorta* (Rolfe) Schltr., *C. brownii* (Rolfe) Schltr., *C. buchholziana* (Kraenzl.) Schltr., *C. crassifolia* Schltr., and probably several Belgian Congo species, as well as the new species described below. The viscidium here is of uniform texture throughout although perhaps a little thinner towards the edges. It is more or less strap-shaped, usually tapering very slightly away from the pollinia and often retuse or emarginate at one or both ends. The flowers are on the average smaller than those in the other section, while the lateral lobes of the rostellum are either nearly the same width along their whole length or taper very gradually towards the apex.

Sectio 2. **Heterocolleticon** *Summerhayes*, sect. nov. Viscidii pars superior prope antheram ± indurata, ephippimorpha, opaca, pars inferior linearis, tenuis, ± hyalina.

Species typica sectionis.—*C. arcuata* (Lindl.) Schltr.

There are about a dozen species in this section which contains among others, *C. aschersoni* (Kraenzl.) Schltr., *C. acuminata* (Rolfe) Schltr., *C. chailluana* (Hook.f.) Schltr., *C. hamata* (Rolfe) Schltr., *C. sedeni* (Rchb.f.) Schltr. and *C. whytei* (Rolfe) Schltr. The species fall into two main divisions, one with broad very fleshy leaves and flowers considerably larger than those in sect. *Homocolleticon*, and including most of the species mentioned above, and a second group, of which *C. aschersoni* is a member, in which the leaves are relatively long and narrow and the flowers are about the same size as in the other section. In sect. *Heterocolleticon* the viscidium consists of two sharply defined parts, the part nearer the anther being hard and tough, wider than the other part and more or less saddle-shaped, particularly after it is detached from the rostellum, as a result of the recurving of the sides. The two stipites arise from this part. The lower part is narrower, very thin in texture and hyaline, and can easily be overlooked. It is probable that it is often torn off during removal of the pollinarium. The lateral lobes of the rostellum in this section are usually appreciably widened just above the narrowed base and then narrowed again to the linear upper part. The stipites also are usually more or less abruptly widened in the upper part below where the pollinia are attached whereas in sect. *Homocolleticon* they are very gradually widened upwards right from the base.

Cyrtorchis (§**Homocolleticon**) **praetermissa** *Summerhayes*, sp. nov. ; affinis *C. crassifoliae* Schltr. et *C. bistortae* (Rolfe) Schltr., ab illa caule ± elongato, foliis longioribus minus carnosis, tepalis latioribus, labello basi paulo dilatato tantum, ab hac planta minore, foliis duplo vel triplo angustioribus, inflorescentiis brevioribus pedunculo fere nullo, bracteis minoribus satis differt.—*C. crassifolia* Summerh. in Bot. Notiser, **1937**, 201 (1937), non Schltr.

Herba epiphytica vel saxicola, fere omnino glabra ; caulis erectus, ± elongatus, simplex, usque ad 19 cm. longus et 1 cm. diametro, apice usque ad 13-foliatus, inferne foliorum vaginis saepius ± induratis fere omnino obtectus, basi radices ramosas flexuosas carnosas laeves griseas emittens. *Folia* 5–10 mm. distantia ; vagina arcta, persistens, circiter 1 cm. longa, primo coriacea, deinde ± indurata, leviter longitudinaliter costata et transverse vel oblique rugulosa ; lamina patens vel saepius ± recurvata vel arcuata, ligulata, sectio ± V-formis, apice fere aequaliter vel inaequaliter bilobulata, lobulis rotundatis longiore usque ad 7 mm. longo, carnosula, usque ad 13 cm. longa, 5–14 mm. lata, saturate viridis, inferne pallidior. *Inflorescentiae* solitares, patentes vel arcuatim recurvatae, usque ad 7 cm. longae, densiuscule usque ad 14-florae, basi vaginis paucis tubulosis imbricantibus truncatis vestitae ; pedunculus brevis, usque ad 1 cm. longus ; rhachis leviter fractiflexa, teres sed supra pedicellem ± excavata, 1–2 mm. diametro ; bracteae pro genere parvae, dimidio inferiore vaginantes, late ovatae, obtusae, 3–5 mm. longae. *Flores* distichi, secundi, erecto-patentes, albi, post anthesin brunnescentes vel aurantiaci, fragrantes ; pedicellus cum ovario circiter 1–1·2 cm. longus. *Sepalum* intermedium ovato- vel rhombico-lanceolatum, acutum, 7·5–9·5 mm. longum, 3·25–5·75 mm. latum ; sepala lateralia e basi ± unguiculata oblique oblongo-lanceolata vel lanceolata, acuta vel subacuta, 9–12 mm. longa, 3–4·25 mm. lata ; omnia sepala subquinque- ad subseptemnervia. *Petala* e basi lata lanceolata, acuminata, 7·5–8·5

mm. longa, 2–4 mm. lata, tri- vel subquinquenervia ; omnia tepala superne ± recurvata. *Labellum* arcuatim recurvatum, lanceolatum, acutum, basi utrinque leviter dilatatum, apice carnosum, 7–9·5 mm. longum, 3·5–4 mm. latum, basi in calcar sensim decurrens ; calcar incurvatum vel leviter sigmoideum, ex ore lato circiter 4 mm. diametro sensim attenuatum, apice obtusum, 2·25–3 cm. longum. *Columna* brevis, crassa, 1·25—1·75 mm. alta, apice truncata, androclinio horizontali leviter excavato ; anthera hemisphaerica, antice in appendix linearem truncatam denticulatam circiter 1·5 mm. longam producta ; pollinia ellipsoideo-globosa vel ellipsoidea, 0·8–1 mm. longa, stipitibus duobus anguste oblanceolato-ligulatis apice rotundatis 2·25–2·75 mm. longis, viscidio singulo ligulato apice emarginato 2·4–3·7 mm. longo 0·5–0·75 mm. lato tenui hyalino ; rostellum porrectum, ornithorrhynchum, apice obtusum, 2·75–3·5 mm. longum, viscidio amoto trifidum ; partitio intermedia brevis, carnosa, acuta ; partitiones laterales lineares, tenues, papillosae ; fovea stigmatica orbicularis. *Ovarium* subacute trigonum, circiter 7 mm. longum, saepius pilis brevibus nigris furfuraceis indutum. *Capsulae* pyriformi-ellipsoideae, obtuse 6-gonae, 10–15 mm. longae, 5–7 mm. diametro.

Uganda. Bunyoro, Budongo Forest, Siba area, June 1943 (sterile), cult. and flowered at Busingiro, Oct. 1943 and 1944, *Eggeling* 5449.

Tanganyika Territory. Iringa Prov., Njombe, on lichen on rock, Dec. 1931, *Lynes* D.k. 169.

Northern Rhodesia. Mwinilunga Distr., just south of Matonchi Farm, in *Brachystegia* woodland, Nov. 1937, *Milne-Redhead* 3146 (type) ; same locality, Dec. 1937, *Milne-Redhead* 3146 A ; half a mile west of River Dobeka, in *Cryptosepalum* woodland, Dec. 1937, *Milne-Redhead* 3530 ; Solwezi Distr., Mutanda Bridge, in *Brachystegia* woodland, flowers over, June 1930, *Milne-Redhead* 528 A ; same locality, in fruit, June 1930, *Milne-Redhead* 597.

Southern Rhodesia. Salisbury Distr., Rumani, cult. National Herbarium, Pretoria, Nov. 1946, *Verdoorn* Nat. Herb. No. 28208 ; Vumba Mts., near Umtali, Dec. 1937, *Obermeyer* Transv. Mus. No. 37027 ; Makoni Distr., The Springs, 5 miles from Rusapi, on rocks, Dec. 1930, *Fries et alia* 3399.

Transvaal. Barberton Distr., Lampspruit, north of White River, flowered National Herbarium, Pretoria, Dec. 1942, *van der Merwe* 2348.

It is quite remarkable that a species as widely spread as the present one should have remained overlooked for such a long time, the earliest record of its gathering in flower being on the Swedish Expedition to Southern Rhodesia in 1930. This gathering was referred by me to the Northern Rhodesian *C. crassifolia* Schltr., which itself was known only from the type specimen. Apart from all the specimens cited above I have also seen good material of *C. crassifolia* collected by Mr. E. Milne-Redhead in the Mwinilunga District of Northern Rhodesia. It is evident that the two species are quite distinct, Schlechter's species differing in its very short stem and short extremely fleshy leaves, and in a number of minor floral characters. For instance the tepals are all narrower than in *C. praetermissa*, while the lateral sepals are broadest just above the base whereas in the latter species there is a sort of claw or narrowed portion at the base

the widest point being just below the middle. The lip in *C. crassifolia* is very much widened near the base to produce two rounded and crenate auricles whereas in *C. praetermissa* the widening is only just noticeable. Nevertheless the species are clearly allied, the general floral characters, particularly the column and pollinarium, agreeing in all essential features.

Ancistrorhynchus schumanni (*Kraenzl.*) *Summerhayes*, comb. nov.

Angraecum schumanni Kraenzl. in Mitth. Deutsch. Schutzgeb. **2,** 159 (1889).

Mystacidium schumanni (Kraenzl.) Rolfe in Dyer, Fl. Trop. Afr. **7,** 173 (1897).

Phormangis schumanni (Kraenzl.) Schltr. in Beih. Bot. Centralbl. **36,** ii. 104 (1918).

Tridactyle schumanni (Kraenzl.) Summerh. in Hutch. & Dalz. Fl. West Trop. Afr. **2,** 463 (1936).

Re-examination of material of the type gathering (*Braun* 20) in the Kew Herbarium and of living material received in 1938 from the Berlin Botanic Gardens under the name of *Angraecum schumanni* shows them to be identical and to belong to the genus *Ancistrorhynchus*. Kraenzlin described, but rather clumsily, the characteristic trilobed rostellum with its turned-up apex but did not state how the pollinia were attached to the large strap-shaped viscidium. Schlechter has a drawing on the type sheet, which I examined in 1935, showing the pollinia attached by a single slender stipes. In the material now examined it can clearly be seen that there are two separate, though very slender, stipites and it seems that these must have been adherent when seen by Schlechter so as to appear one.

The original description, dissections made from the Type Sheet and also the material now available (Type duplicate and living material) all agree with the genus *Ancistrorhynchus* in other respects, such as the shape of the perianth members and lip, which latter completely lacks the thickened basal articles characteristic of the genus *Tridactyle*. The general habit is very similar to that of *A. parviflora* Summerh. from Tanganyika Territory and also, although on a much smaller scale, to other species from West Africa. The most striking feature is the reduction of the inflorescences to 2 or 3 flowers only, which are subtended by comparatively small bracts.

Tridactyle Schltr.

Owing to the accumulation of numerous specimens which could not be satisfactorily determined it seemed advisable to re-examine this genus which had not been critically revised since Schlechter dealt with it in his treatment of the Angraecoid Orchids (Beih. Bot. Centralbl. **36,** ii. 142–149 : 1918). The result of my investigations is to confirm Schlechter's general views, the genus being a very natural one. Schlechter recognised two subgenera, *Eu-tridactyle*, containing the great bulk of the species (29 species), and *Nephrangis*, comprising a solitary species. In my opinion the differences between these two are of generic importance and I am therefore raising *Nephrangis* to generic rank. *T. erecto-calcarata* (De Wildem.) Schltr. is shown, on examination of the type, to be a *Rhipidoglossum* but otherwise the genus is substantially as conceived by Schlechter.

Many of the species enumerated by him, however, prove to be conspecific, but I have found it necessary to describe 12 new species so that the total number now recognised by me is 35. *Angraecum schumanni* Kraenzlin, which was placed by me in the genus *Tridactyle* in the Flora of West Tropical Africa, is on re-examination clearly an *Ancistrorhynchus* and is therefore excluded from this account.

In *T. wakefieldii* (Rolfe) Summerh. we have a plant which, though differing from the main part of the genus in the climbing habit and distant leaves, in the lack of basal auricles to the lip, in the short obtuse rostellum and in the correspondingly short stipes to the pollinarium, has a deeply trilobed lip and does not seem to fit into any other genus. I am therefore retaining it provisionally in *Tridactyle* as a separate section but it is quite possible that further investigation of the Angraecoids will necessitate the creation of a new genus to contain it. In habit it is very similar to the genera *Solenangis* Schltr. and *Dinklageella* Mansf.

Tridactyle *Schltr.*, Die Orchid. 601 (1914), et in Beih. Bot. Centralbl. **36,** ii. 142–143 (1918), excl. subgen. *Nephrangis.*

Sepala et petala ± patentia vel recurvata ; sepala oblonga, elliptica, ovata vel lanceolata, lateralia obliqua, basi margine anteriore saepius paulo dilatata et inter se saepe breviter connata ; petala sepalis vulgo angustiora, ± obliqua. *Labellum* saepissime juxta basin lobulis 2 auriculiformibus instructum, deinde ± cuneatum, rarius indivisum ovatum vel lanceolatum, saepius ± trilobatum, lobis lateralibus saepe apice ± fimbriatis vel digitatis, calcari cylindrico interdum ± clavato-inflato saepius labello satis longiore. *Columna* brevis, crassa ; androclinium leviter reclinatum vel horizontale, leviter excavatum ; anthera cucullata, antice truncata vel breviter producta ; pollinia 2, ovoidea vel subglobosa, stipite angusto superne saepius dilatato interdum dimidio apicali usque ad medium bifido, viscidio saepius parvo orbiculari elliptico vel ± lunato; rostellum productum, porrectum vel saepius ± decurvatum, acutum, interdum viscidio amoto ± bifidum.

Plantae epiphyticae ; caulis ± elongatus, bene foliatus, rarius scandens; folia ± teretia vel plana, linearia vel ligulata, apice saepius ± inaequaliter bilobulata, coriacea vel carnosa ; racemi brevissimi ad elongati foliis fere aequilongi, pauci- ad multiflori ; bracteae parvae ; flores parvi ad mediocres (usque ad 4 cm. diametro).

Species circiter 35 adhuc notae, Africae tropicae et australi indigenae.

Species lectotypica.—*T. bicaudata* (Lindl.) Schltr.

Sectio 1. **Eu-tridactyle** (*Schltr.*) *Summerh.*

Tridactyle subgen. *Eu-tridactyle* Schltr. in Beih. Bot. Centralb. **36,** ii. 143–148 (1918), pro maxime parte.

Caules erecti vel dependentes, saepius basi tantum radicati ; labellum basi utrinque auriculatum vel lobulatum ; pollinii stipes quam polliniis longior, viscidium parvum ; rostellum ± ornithorrhynchum, acutum, viscidio amoto apice tantum ± bifidum.

Species typica sectionis.—*T. bicaudata* (Lindl.) Schltr.

Sectio 2. **Scandentes** *Summerh.*

Caules graciles, scandentes, fere usque ad apicem radicati ; labellum basi exauriculatum ; pollinii stipes quam polliniis brevior, viscidium pro rata magnum ; rostellum breve, latum, obtusissimum, viscidio amoto fere omnino bifidum.

Species unica sectionis.—*T. wakefieldii* (Rolfe) Summerh.

Below will be found an enumeration and partial key to the species. The species are arranged approximately according to the length of the inflorescence, from shortest to longest. As we have insufficient material of several of the species and discoveries of additional species can be expected I have not attempted to provide a detailed key. Notes on various species and descriptions of new species follow under the appropriate numbers.

Sect. *Eu-tridactyle* (Schltr.) Summerh.

A. Inflorescences very short (up to 1 cm. long) ; lip (excluding auricles) entire or with a very short tooth on each side.

1. T. anthomaniaca (Rchb.f.) Summerh.
2. T. crassifolia Summerh.
3. T. laurentii (De Wildem.) Schltr.
4. T. muriculata (Rendle) Schltr.
5. T. oblongifolia Summerh.
6. T. nalaensis (De Wildem.) Schltr.

B. Inflorescences very short ; lip trilobed, lateral lobes usually entire, rarely more or less divided at the apex.

7. T. tridentata (Harv.) Schltr.
8. T. virgula (Kraenzl.) Schltr.
9. T. scottellii (Rendle) Schltr.
10. T. lagosensis (Rolfe) Schltr.
11. T. nigrescens Summerh.
12. T. eggelingii Summerh.
13. T. translucens Summerh.
14. T. inflata Summerh.

C. Inflorescences short to medium (1–4 cm. long) ; lip rarely entire but usually trilobed, the lateral lobes entire or slightly fimbriate or divided towards the apex.

15. T. inaequilonga (De Wildem.) Schltr.
16. T. stipulata (De Wildem.) Schltr.
17. T. phaeocephala Summerh.
18. T. cruciformis Summerh.
19. T. brevifolia Mansf.
20. T. fusifera Mansf.
21. T. teretifolia Schltr.

D. Inflorescences long (usually over 4 cm. long) ; lip lateral lobes narrow, entire or slightly divided towards the apex.

22. T. armeniaca (Lindl.) Schltr.
23. T. brevicalcarata Summerh.
24. T. kindtiana (De Wildem.) Schltr.
25. T. tridactylites (Rolfe) Schltr.

E. Inflorescence long ; lip lateral lobes narrow, divided into numerous fimbriae at and near apex.

26. T. bicaudata (Lindl.) Schltr.
27. T. gentilii (De Wildem.) Schltr.

F. Inflorescence long ; lip lateral lobes broad, truncate, more or less toothed.

28. T. truncatiloba Summerh.
29. T. unguiculata Mansf.

G. Inflorescence long ; leaves broad, narrowly elliptical, texture thin ; lip lateral lobes or entire lip margin fimbriate.

30. T. latifolia Summerh.
31. T. fimbriatipetala (De Wildem.) Schltr.

H. Inflorescence long ; lip with relatively long narrow undivided portion, middle lobe acuminate, much longer than laterals ; basal auricles rounded, not very distinct ; stipes of pollinia usually bifid in upper portion.

32. T. tricuspis (Bolus) Schltr.
33. T. furcistipes Summerh.
34. T. sarcodantha Mansf.

Sect. *Scandentes* Summerh.

35. T. wakefieldii (Rolfe) Summerh.

1. **Tridactyle anthomaniaca** (*Rchb.f.*) *Summerhayes*, comb. nov.

Listrostachys anthomaniaca Rchb.f. in Linnaea, **41,** 75 (1877).

Angraecum lepidotum Rchb.f. in Gard. Chron. ser. 2, **13,** 806 (1880), in obs., nomen ; et ex Rolfe in Dyer, Fl. Trop. Afr. **7,** 146 (1897).

A. wittmackii Kraenzl. in Mitt. Deutsch. Schutzgeb. **2,** 158 (1889).

Listrostachys wittmackii (Kraenzl.) Rolfe in Dyer, Fl. Trop. Afr. **7,** 158 (1897).

Angraecum trachyrrhizum Schltr. in Engl. Bot. Jahrb. **26,** 343 (1899).

Tridactyle lepidota (Rchb.f. ex Rolfe) Schltr. in Beih. Bot. Centralbl. **36,** ii. 146 (1918).

T. trachyrrhiza (Schltr.) Schltr. l.c. 147 (1918).

For some unknown reason Reichenbach's *Listrostachys anthomaniaca* has been completely ignored by all subsequent workers on African orchids in spite of the fact that he gives a very adequate description. Unfortunately he makes an error as regards the origin of his specimen which he says was collected by Monteiro in the Bonny Mountains of Angola. It is true that many of Monteiro's plants were collected in Angola, but there happens to be a specimen in the Kew Herbarium labelled " Bonny, June 1873, growing on a tree. From J. J. Monteiro, June 1873." This is clearly Bonny in the Niger Delta in Nigeria which was a frequent port of call for ships at that time. This specimen is cited by Rolfe in the Flora of Tropical Africa under *Angraecum lepidotum* but agrees in every detail with the description of *Listrostachys anthomaniaca*. No doubt Monteiro sent specimens of this gathering both to Kew and to Reichenbach who published the description a few years later.

Angraecum wittmackii was originally described by Kraenzlin from material collected in the Cameroons by Braun. In his treatment of the Angraecoid Orchids (Beih. Bot. Centralbl. **36,** ii. 133 : 1918) Schlechter deals with it under the genus *Cyrtorchis* but suggests that it should be treated as a " species delenda " because the original material has been lost and Kraenzlin's comments and suggestions of affinity are confusing. Careful reading of the description, however, leaves little doubt that the species is identical with *Listrostachys anthomaniaca* and is therefore a *Tridactyle.*

I have now seen material of this species from Sierra Leone in extreme West Africa right across the Congo Basin to Kenya Colony and northern Tanganyika Territory. The species also occurs in southern Tanganyika, north-eastern Rhodesia and in Mozambique and it will be interesting to see if further records can be made linking these two areas of distribution. As the species is a rain-forest plant the discontinuous distribution in eastern Africa is not surprising.

2. **Tridactyle crassifolia** *Summerhayes*, sp. nov. ; affinis *T. anthomaniacae* (Rchb.f.) Summerh., a qua foliis angustioribus crassis sectione rotundato-deltoideis superne anguste canaliculatis vel sulcatis suberectis vel leviter incurvatis satis distinguenda.

Herba epiphytica. *Caulis* elongatus, ramosus, ± 40 cm. longus, 4–5 mm. diametro, foliorum vaginis arctis rugulosis sparse nigro-pilosis omnino vestitus. *Radices* non visae. *Folia* numerosa, 1–1·5 cm. distantia, suberecta vel leviter incurvata, lineari-ligulata sed carnosa, sectione ± deltoidea, supra leviter V-formia, secus medium anguste canaliculata, subtus convexa, leviter angulata vel rotundata, marginibus acutis, apice inaequaliter bilobata, lobulis rotundatis longiore 3–8 mm. longo breviore brevissimo, tota 3–8 cm. longa, 6–8 mm. lata, sparse nigro-lepidota vel brevissime pilosa. *Inflorescentiae* brevissimae, 2–3-florae ; bracteae parvae, triangulares. *Flores* flavi ; pedicellus cum ovario fere 5 mm. longus. *Sepalum* intermedium oblongo-lanceolatum vel oblongo-ovatum, subacutum, 4·7 mm. longum, 1·75–2·25 mm. latum ; sepala lateralia valde obliqua, oblongo-ovata, apice leviter acuminata et recurvata, 3·5–5 mm. longa, 2·25–2·5 mm. lata ; omnia sepala tri- vel subquinquenervia, extra ± nigro-lepidota vel pilosula. *Petala* lanceolata, acuta vel acuminata, basi leviter dilatata, 4–5 mm. longa, c. 1·25 mm. lata. *Labellum* lanceolatum, superne recurvatum, basi utrinque lobulo brevi dentiformi instructum, integrum vel medio utrinque denticulatum, totum 3·75–4·25 mm. longum, 1–1·5 mm. latum, quinquenervium ; calcar rectum vel leviter curvatum, superne ± dilatatum, 10–15 mm. longum. *Columna* brevis, crassa, semiteres ; androclinium leviter excavatum ; anthera semiglobosa, antice acute producta ; pollinia pyriformi-globosa, 0·65 mm. longa, stipite ligulato superne valde dilatato 1·2 mm. longo, viscidio orbiculari. *Rostellum* ornithorrhynchum, decurvum ; fovea stigmatica quadratum ; ovarium sulcatum, breviter nigro-pilosum vel lepidotum.

Gold Coast. Efiduase, 1936–37, *Cox* 33.

Gabon. Upper Ngounyé River, Mouyamba, flowers yellow, Jan. 1925, *Le Testu* 5173 (type).

Belgian Congo. Cult. Jardin Gillet, Kisantu, *Callens* 805.

This species is clearly allied to *T. anthomaniaca* (Rchb.f.) Summerh. and *T. muriculata* (Rendle) Schltr., the floral structure being very similar in all three. From both species it differs in its very thick fleshy leaves which are more or less triangular in section, the upper surface being slightly hollowed-out or V-shaped with a deep narrow groove running along the middle. The lower surface is convex with an obscure rounded keel, but the two margins are quite acute. On drying the leaf margins tend to curl inwards whereas in *T. anthomaniaca* they become recurved as the leaves dry. The species probably occurs in the forest regions of the Cameroons and Nigeria.

5. **Tridactyle oblongifolia** *Summerhayes*, sp. nov. ; affinis *T. anthomaniacae* (Rchb.f.) Summerh. et *T. muriculatae* (Rendle) Schltr., ab utraque foliis majoribus anguste oblongis, ab illa foliis minus carnosis, calcari satis longiore, ab hac calcari duplo breviore distinguitur.

Herba epiphytica ; caulis elongatus basi pauciramosus, foliatus, usque ad 8 cm. longus, 4–5 mm. diametro, teres, foliorum vaginis fere omnino obtectus, prope basin radices emittens ; radices flexuosae, ramosae, griseae, dense squamosae, 1–3 mm. diametro. *Folia* 1–2·5 cm. distantia ; lamina ± patens, fere plana, leviter canaliculata, anguste vel ligulato-oblonga, basi interdum leviter angustata, apice inaequaliter bilobulata, lobulis rotundatis longiore usque ad 1 cm. longo, tota 3–12 cm. longa, 7–17 mm. lata ; vagina tubulosa, arcta, striata et transverse rugulosa, 1–2 cm. longa, sparse nigro-lepidota. *Inflorescentiae* brevissimae, pedunculo communi usque ad 4 mm. longo, 2–3-florae ; bracteae breves, triangulares, ± paleaceae. *Flores* fere sessiles, virides vel viridi-albi, deinde flavi vel pallide flavido-aurantiaci. *Sepalum* intermedium late lanceolato- vel elliptico-oblongum, apice breviter obtuse acutatum, 5–5·25 mm. longum, 2–2·5 mm. latum ; sepala lateralia oblique ovata vel oblongo-ovata, ± breviter acuminata, 4·25–5·75 mm. longa, 2–2·75 mm. lata ; omnia sepala trinervia vel subquinquenervia, extra ± dense nigro-lepidoto-pilosula. *Petala* lanceolata, leviter curvata, acuta, 4·5–5 mm. longa, 1–1·5 mm. lata, trinervia. *Labellum* basi utrinque dente acuto instructum, superne recurvatum, lanceolatum, acutum, ± concavum, 3·75–5 mm. longum, 1–1·75 mm. latum ; calcar ex ore lato subito angustatum, deinde anguste tubulosum superne levissime inflatum, 12–14·5 mm. longum, sparse nigro-pilosulum. *Columna* brevis, crassa, 1·5–2 mm. longa ; androclinium leviter excavatum ; anthera subhemisphaerica, antice truncata vix producta ; pollinia ovoidea, 0·6 mm. longa, stipite communi ligulato superne valde dilatato circiter 1·25 mm. longo, viscidio parvo elliptico ; rostellum leviter recurvatim productum, acutum ; fovea stigmatica orbicularis ; ovarium leviter sulcatum, 3·5–5·5 mm. longum, dense nigro-lepidoto-pilosulum.

Sierra Leone. Origin unknown (possibly from Roruks or Njala), cult. Njala, Nov. 1946, *Deighton* 4393.

Oubangui-Chari. Upper Kotto Rover, village of Yadélé, 30 km. from Yalinga on road to Bangassu, Nov. 1922, *Le Testu* 4314 (type).

Belgian Congo. Panga, Aruwimi River, in forest, on trees above river, Dec. 1913, *Bequaert* 1569.

Uganda. Buddu, 1905, *Dawe* 311.

Clearly a widespread species along the northern edge of the African forest region. The relatively large oblong or ligulate-oblong leaves distinguish it from the other species with very short inflorescences and entire lip lamina.

7. **Tridactyle tridentata** (*Harv.*) *Schltr.* in Engl. Bot. Jahrb. **53,** 603 (1915), in obs.

Angraecum tridentatum Harv. Thes. Cap. **2,** 6 (1863).

A. filifolium Schltr. Westafr. Kautschuk-Exped. 284 (1900), nomen ; et in Engl. Bot. Jahrb. **38,** 21 (1905).

A. goetzeanum Kraenzl. in Engl. Bot. Jahrb. **30,** 289 (1901).

Listrostachys linearifolia De Wildem. Not. Pl. Utiles Congo, **1,** 149 (1903).

Angraecum bolusii Rolfe in Dyer, Fl. Cap. **5,** iii. 73 (1912).

Tridactyle goetzeana (Kraenzl.) Schltr. in Engl. Bot. Jahrb. **53,** 602 (1915).

T. bolusii (Rolfe) Schltr. l.c. 603 (1915), in obs.

T. filifolia (Schltr.) Schltr. in Beih. Bot. Centralbl. **36,** ii. 144 (1918).

T. linearifolia (De Wildem.) Schltr. l.c. 146 (1918).

Examination shows that all the above species are better referred to one widespread if rather variable species, which is found over the greater part of the forest areas of Tropical Africa extending southwards into Natal.

The leaves in this species are semi-terete or terete with a groove running along the upper surface. This groove starts as a wide depression near the base and becomes narrower farther up the leaf. The leaves themselves vary both in length and diameter, long and short leaves occurring in the same plant although there is usually not so much variation in diameter in any given plant. The type specimen from Natal has exceptionally short and thick leaves but other specimens from this area exhibit much the same variations as elsewhere.

Floristically there is little variation except in the basal lobes (auricles) of the lip but this variation is common to most species of *Tridactyle*. The side lobes, although usually quite short or even tooth-like, may rarely nearly equal the middle lobe.

var. **subulifolia** *Summerh.*, var. nov. ; a typo foliis subulatis teretibus haud sulcatis, floribus paulo minoribus differt.

Belgian Congo. Uele River, Amadi, between Bambili and Niangara, April 1904, *Seret* 840 ; Romée, Feb. 1906, *M. Laurent* 1768.

Uganda. Bunyoro, Budongo Forest, June 1935, *Eggeling* 2087 ; same locality, flowers orange when collected, probably faded from white, Sept. 1940, *Eggeling* 4051 ; same locality, Dec. 1942 (sterile), flowered Busingiro April 1943 and April 1944, *Eggeling* 5277 (type) ; Mengo, Kipayo, 1200 m., in forests on *Piptadenia africana*, June 1914, *Dummer* 848 ; Entebbe, on tall massive trees, Aug. 1922, *Maitland* 103.

This variety differs from the type in lacking the marked longitudinal groove along the upper surface of the leaf, the latter being quite terete.

On drying a number of minor wrinkles or sulcae are formed but no continuous groove can be detected. In floral structure there seems to be no difference although the flowers in the variety are on the average a little smaller than in the type.

11. **Tridactyle nigrescens** *Summerhayes*, sp. nov. ; a *T. lagosensi* (Rolfe) Schltr. foliis angustioribus siccitate nigrescentibus, labelli lobis lateralibus intermedio aequilongis vel fere aequilongis apice ± breviter fimbriatis, calcari labelli lamina duplo vel triplo longiore facile distinguenda.

Herba epiphytica ; caulis ± dependens, pauciramosus, gracilis, parte apicali foliatus, usque ad 35 cm. longus, 2–3 mm. diametro, superne vaginis foliorum omnino obtectus, basi radices flexuosas ramosas ± applanatas emittens. *Folia* 5–15 mm. distantia ; vagina arctissima, rugulosa, leviter longitudinaliter sulcata ; lamina patens vel saepius ± deflexa vel recurvata, linearis, ± conduplicata vel V-formis, apice ± inaequaliter bilobulata lobulis rotundatis vel leviter retusis longiore usque ad 7 mm. longo breviore brevissimo, 1·5–7 cm. longa, 2–3 mm. lata, pallide laete viridis, siccitate nigrescens. *Inflorescentiae* breves, usque ad 7 mm. longae, 2–3-florae ; bracteae laxe ochreatae, obtusae vel rotundatae, vix 1 mm. longae. *Flores* 1·5–2 mm. distantes, ± patentes, flavidi vel pallide virides, fragrantes ; pedicellus cum ovario 2·5–3 mm. longus. *Sepalum intermedium* late lanceolatum vel oblongo-ovatum, acutum vel breviter obtusque acuminatum, 3–3·5 mm. longum, 1·5–2·25 mm. latum ; sepala lateralia oblique ovata, breviter acuminata, 3–3·5 mm. longa, 1·75–2·25 mm. lata ; omnia sepala trinervia, saccis cristalliferis numerosis distinctis. *Petala* oblique oblongo-lanceolata, acuta, marginibus subdenticulatis, 2·75–3·75 mm. longa, 1–1·25 mm. lata, subtrinervia. *Labellum* basi auriculis quadratis vel triangularibus instructum, dimidio inferiore ± cuneatum, medio trilobatum, totum 2·5–4 mm. longum ; lobus intermedius triangularis, subacutus, 1–1·25 mm. longus, 0·75–1 mm. latus ; lobi laterales ± divergentes, ligulati, apice ± in fimbrias paucas breves soluti, intermedio aequilongi vel paulo breviores ; calcar rectum vel leviter decurvatum, cylindricum, dimidio apicali leviter inflatum, 5–7 mm. longum. *Columna* brevis, crassa ; androclinium reclinatum, leviter excavatum ; anthera hemisphaerica, antice truncata haud producta ; pollinia fere globosa vel ovoidea, 0·5–0·6 mm. diametro, stipite communi ligulato superne dilatato 0·6 mm. longo, viscidio orbiculari parvo ; rostellum decurvatim productum, acutum ; fovea stigmatica orbicularis ; ovarium 2·5 mm. longum, leviter sulcatum, pilis brevibus nigris furfuraceis sparse instructum. *Capsula* ellipsoidea, costata, 10 mm. longa, 5 mm. diametro, pallide brunnea.

Belgian Congo. Between Nyamlagira and Tschambene, 2000 m. alt., in island of sclerophyllous forest, Feb. 1945, *Germain* 3602 ; Mt. Kahuzi, S.W. corner of Lake Kivu, 2400–2700 m. alt., coll. F. L. Hendrickx, flowered at Amani, April 1944, *Moreau* 537.

Uganda. Ankole, Kyamahunga near Kalinzu Forest, June 1938, *Eggeling* 3722 (type) ; Masaka, Kyanamulnalna, 1170 m. alt., in woodland, occasional, Nov. 1942 (in fruit), *Thomas* 4088.

This interesting little species, easily recognised in dried specimens by the blackening of the leaves, is clearly related to *T. lagosensis* (Rolfe) Schltr. in the general growth, the nature of the leaves and the short inflorescence. It differs especially in the much longer spur and in the side lobes of the lip being divided at the apex to form a small number of short finger-like lobes. So far the plant is known only from the forest regions of the eastern Belgian Congo and Uganda.

12. **Tridactyle eggelingii** *Summerhayes*, sp. nov. ; affinis *T. lagosensi* (Rolfe) Schltr. et *T. nigrescenti* Summerh., ab illa labelli lobis lateralibus intermedio longioribus apice in fimbrias solutis, calcari quam lamina duplo longiore, ab hac foliis latioribus siccitate non nigrescentibus, floribus majoribus, labelli lobis lateralibus longioribus apice magis fimbriatis satis differt.

Herba epiphytica ; caulis elongatus, ± ramosus, foliatus, usque ad 30 cm. longus, 2–3 mm. diametro, superne vaginis foliorum fere omnino obtectus, basi radices flexuosas ramosas teretes griseas 1–2 mm. diametro emittens. *Folia* 8–15 mm. distantia, ± patentia ; vagina arctissima, longitudinaliter striata, transverse rugulosa, internodio aequilonga vel paulo brevior, apice lamina opposita ligula subulata instructa ; lamina anguste lanceolato-ligulata vel lineari-ligulata, apice ± inaequaliter bilobulata, lobulis rotundatis longiore usque ad 3·5 mm. longo, tota 2–6 cm. longa, 3–6 mm. lata, siccitate fuscata sed vix nigrescens. *Inflorescentiae* brevissimae, usque ad 8 mm. longae, 2–3-florae ; bracteae breviter ochreatae, obtusae vel rotundatae, vix 1 mm. longae. *Flores* 1–3 mm. distantes, margaritaceo-virides vel albidi ; pedicellus cum ovario fere 4 mm. longus. *Sepalum intermedium* lanceolato-ovatum, acutum vel late apiculatum, 4·25–4·5 mm. longum, 2·25–2·5 mm. latum ; sepala lateralia oblique ovata, breviter sed obtuse acuminata, circiter 4·5 mm. longa, 2·5–2·75 mm. lata ; omnia sepala convexa, carnosula, trinervia. *Petala* leviter curvatim oblonga vel ligulato-oblonga, acuta, 3·75–4·25 mm. longa, 1·25–1·75 mm. lata, trinervia vel subtrinervia. *Labellum* basi auriculis brevibus deltoideis vel quadrato-truncatis instructum, medio trilobatum, totum 4–4·5 mm. latum, explanatum 5–6 mm. latum ; lobus intermedius elongato-triangularis, acutus, 1·75–2 mm. longus, 0·75–1·25 mm. latus ; lobi laterales divergentes, ligulati, apice in fimbrias paucas soluti, 3–3·5 mm. longi ; calcar rectum vel levissime sigmoideum, cylindricum, superne leviter inflatum, 6–7 mm. longum. *Columna* brevis, crassa, antice excavata, circiter 1·5 mm. longa ; androclinium reclinatum vel fere horizontale, leviter excavatum ; anthera hemisphaerica, antice haud producta ; pollinia fere globosa, 0·5 mm. diametro, stipite cuneato-trapeziformi basi unguiculatim angustato 0·75 mm. longo, viscidio elliptico ; rostellum productum, lineare, acutum ; ovarium circiter 3 mm. longum, leviter sulcatum, pilis brevibus furfuraceis sparse praeditum.

Belgian Congo. Parc National Albert, Nyamlagira, a little beyond Mushumangabo, 2000 m. alt., in mountain forest, in crown of *Entandophragma speciosum*, Dec. 1944, *Germain* 3121.

Uganda. Kigezi, Impenetrable Forest, Nyebeya, Oct. 1940, *Eggeling* 4186 (type).

This species, which comes from the same general district as *T. nigrescens* Summerh., is clearly a near relative of that species but differs in a number of points mentioned in the diagnosis. The division of the lateral lobes of the lip is more pronounced here than in *T. nigrescens*, these species and *T. lagosensis* (Rolfe) Schltr., which has entire lobes, forming a series in this respect.

13. **Tridactyle translucens** *Summerhayes*, sp. nov. ; affinis *T. nigrescenti* Summerh. et *T. eggelingii* Summerh., a quibus foliis crebrioribus crassioribus sectio leviter V-formibus, inflorescentiis longioribus usque ad 6-floris satis distinguitur.

Herba epiphytica ; caules erecti, vix ramosi, superne foliati, usque ad 20 cm. longi, 2·5–3 mm. diametro, vaginis foliorum fere omnino obtecti, basi radices flexuosas ramosas laeves griseas emittentes. *Folia* circiter 5 mm. distantia, disticha ; vagina arctissima, leviter rugulosa, apice lamina opposita ligula subulata instructa ; lamina patens vel leviter recurvata, rigida, ligulata vel lanceolato-ligulata, sectio leviter V-formis, apice ± inaequaliter bilobulata, lobulis rotundatis vel obtusis longiore usque ad 4 mm. longo, tota 2–4 cm. longa, 4–8 mm. lata, carnosa, crassiuscula, laete viridis. *Inflorescentiae* patentes vel leviter decurvatae, usque ad 1 cm. longae, 2–6-flores ; bracteae breviter ochreatae, truncatae, vix 1 mm. longae. *Flores* 1–2 mm. distantes, viridi-albi, translucentes, anthera pallide fulvida ; pedicellus cum ovario 3–3·5 mm. longus. *Sepalum intermedium* lanceolato-ovatum, apice acuminatum, 4 mm. longum, 2·5 mm. latum ; sepala lateralia oblique oblongo-lanceolata, apice leviter acuminata, 4·75 mm. longa, 2·5 mm. lata ; omnia sepala patentia, trinervia vel subquinquenervia. *Petala* patentia vel leviter recurvata, oblongo-lanceolata, acuta, superne subdenticulata, 3·5 mm. longa, 1·5 mm. lata, trinervia. *Labellum* deflexum, basi auriculis quadratis ± retusis instructum, medio trilobatum, totum 3·75 mm. longum, 3·5 mm. latum, papillosum ; lobus intermedius triangulari-ligulatus, acutus, 1·5 mm. longus, basi circiter 0·5 mm. latus ; lobi laterales divergentes, ligulati, apice in fimbrias paucas breves soluti, circiter 1·5 mm. longi ; calcar fere rectum, cylindricum, 8·5 mm. longum. *Columna* brevis, crassa, apice truncata, androclinio leviter excavato ; anthera hemisphaerica, antice breviter acute producta ; pollinia ovoidea vel fere globosa, fere 0·5 mm. longa, stipite communi cuneato apice dilatato acuto 0·6 mm. longo, viscidio semilunato antice excavato 0·3 mm. lato ; rostellum productum, acutum ; fovea stigmatica transverse elliptica. *Ovarium* circiter 3 mm. longum, leviter sulcatum, in sulcis pilis furfuraceis paucis praeditum.

N. Rhodesia. Mwinilunga District, just E. of River Kasompa, on trees in *Cryptosepalum* woodland, March 1938, *Milne-Redhead* 4438 (type).

This is evidently another member of the group allied to *T. lagosensis* (Rolfe) Schltr. but differing from the other species in the smaller fleshier more closely placed leaves and greater number of flowers in the slightly longer inflorescence. The specific epithet is given in allusion to the texture of the flowers which are said by the collector to be " like frosted glass."

14. **Tridactyle inflata** *Summerhayes*, sp. nov. ; affinis *T. stipulatae* (De Wildem.) Schltr., sed foliis pro rata brevioribus, tepalis obtusioribus, labelli lobis lateralibus brevibus truncatis pectinatis, calcari valde inflato facile distinguenda.

Herba epiphytica ; caules caespitosi, crebri, plus 15 cm. longi, circiter 5 mm. diametro, superne foliati, vaginis foliorum fere omnino obtecti ; radices non visae. *Folia* 5–10 mm. distantia ; vagina arcta, leviter longitudinaliter costata, leviter rugulosa, internodio aequilonga vel paulo brevior ; lamina patens vel leviter recurvata, ligulata, basi ± conduplicata, apice ± inaequaliter bilobulata, lobulis rotundatis brevissime obtuseque denticulatis longiore usque ad 4 mm. longo, tota 5–7 cm. longa, 7–9 mm. lata, saturate viridis, nitida. *Inflorescentiae* breves, usque ad 1 cm. longae, graciles, circiter 3-flores ; bracteae breviter ovato-cupulares, vaginantes, circiter 1 mm. longae. *Flores* 2–3 mm. distantes, pallide thalassini, columna aurantiaca ; pedicellus cum ovario 5–6 mm. longus. *Sepalum intermedium* elliptico-oblongum, obtusum, 3·75 mm. longum, 1·75 mm. latum ; sepala lateralia oblique ovato-oblonga, margine postico basi valde dilatata, apice acuta, 3·75 mm. longa, 2·25 mm. lata. *Petala* anguste elliptico-oblonga, subacuta, 3·75 mm. longa, 1·25–1·5 mm. lata ; omnia tepala subconniventia, trinervia, nervis secondariis transversis. *Labellum* basi auriculis brevibus triangularibus instructum, cuneato-flabellatum, totum 3 mm. longum, 3·25 mm. latum, supra medium obscure trilobatum ; lobus intermedius triangularis, acutus, 0·75 mm. longus, 1·25 mm. latus ; lobi laterales breves, lati, truncati, breviter pectinato-divisi ; calcar fere rectum, duobus trientibus apicalibus valde inflatum, obtusum, 5·5 mm. longum, 1·5 mm. diametro. *Columna* brevis, crassa, apice truncata, androclinio reclinato leviter excavato ; anthera ± hemisphaerica, secus medium depressa, papillosa, antice breviter deltoideo-producta ; pollinia ovoidea, fere 0·6 mm. longa, stipite ligulato superne dilatato 0·5 mm. longo, viscidio parvo transverse elliptico ; rostellum porrectum, acutum ; fovea stigmatica transverse elliptica vel fere orbicularis. *Ovarium* leviter curvatum, circiter 5 mm. longum, glabrum.

Tanganyika Territory. South Masailand, summit of Njoro Hill, near Kibaya, 1800 m. alt., on thorn and *Combretum* trees, heavily draped in moss and lichen, subjected to morning mist, July 1942, *Elliott*, comm. *W. M. Moreau*, no. 326 (type). " Stems crowded forming a dense clump ; leaves dark glossy green ; flowers pale sea-green with orange column, emitting a slight diurnal scent."

In general habit and inflorescence this is clearly related to *T. stipulata* (De Wildem.) Schltr. but differs in the swollen spur and shape of the lip. This latter organ has a small triangular auricle on each side at the base and is then cuneately or flabellately widened to form an approximately obtriangular lamina which is more or less truncate in front. The anticous margin is divided to form three rather indistinct lobes of which the central one is broadly triangular and rather longer than the others. On each side of the central lobe the margin is irregularly divided in a comb-like manner the outside divisions being the longest, and the whole forming the side lobes. About 11 more or less parallel nerves run down into the lamina of the lip.

The species comes from a part of Tanganyika Territory which has been little explored botanically but which has already yielded several new and interesting species (e.g. *Polystachya praecipitis* Summerh.).

15. **Tridactyle inaequilonga** (*De Wildem.*) *Schltr.* in Beih. Bot. Centralbl. **36,** ii. 145 (1918).

T. acutoemarginata (De Wildem.) Schltr., l.c. 143 (1918).

Angraecum inaequilongum De Wildem. in Bull. Jard. Bot. Brux. **5,** 187 (1916).

A. acutoemarginatum De Wildem. l.c. 181 (1916).

Examination of the two type specimens of the above species indicates that they merely represent slight variants of a single species. In *A. acutoemarginatum* the shorter of the two unequal lobes of the leaf-apex is well-developed and acute, whereas in the other specimen this lobe is only slightly developed. In growth, shape of leaves, inflorescences and flowers the two are almost identical. As both were published in the same paper I have chosen the epithet *inaequilonga* as being more suitable botanically and less awkwardly constructed, the two specimens being equally good.

The species is closely allied to *T. stipulata* (De Wildem.) Schltr., both species possessing the prominent "stipule" at the apex of the leaf-sheath. *T. stipulata* has rather more parallel-sided leaves with almost equal rounded lobes and broader perianth segments, but even so further research may show it and *T. inaequilonga* to be conspecific. For the moment I am keeping the species separate but it should be noted that I have seen nothing but the three type specimens and a cultivated sterile stem which may have come from the type plant of *T. stipulata.*

17. **Tridactyle phaeocephala** *Summerhayes*, sp. nov. ; a *T. stipulata* (De Wildem.) Schltr. foliis angustioribus, florum colore, tepalis paulo majoribus obtusioribus, labelli lobis lateralibus apice in fimbrias solutis differt.

Herba epiphytica ; caules elongati, erecti vel ± pendentes, graciles, pauciramosi, superne foliati, usque ad 30 cm. longi, 2–3 mm. diametro, primo foliorum vaginis omnino obtecti, basi radices flexuosas ramosas laeves griseas 1–2·5 mm. diametro emittentes. *Folia* 7–16 mm. distantia ; vagina arcta, leviter compressa, leviter longitudinaliter pluricostata, internodio longior ; lamina suberecta, patens vel ± recurvata, linearis vel lineari-ligulata, basi conduplicata, apice aequaliter vel ± inaequaliter bilobulata, lobulis acutis ad rotundatis obtuse denticulatis longiore usque ad 6 mm. longo, tota 4–14 cm. longa, 3–7 mm. lata, laete viridis, nitida. *Inflorescentiae* patentes vel suberectae, 1–3·5 cm. longae, 3–7-florae ; bracteae cupulari-vaginantes, ovatae, acutae vel obtusae, 1–2 mm. longae. *Flores* 3–5 mm. distantes, virides, anthera brunnea ; pedicellus cum ovario 3·5–4·5 mm. longus. *Sepalum* intermedium lanceolatum vel anguste ellipticum, apice acutum vel obtusum, 4·75–6 mm. longum, 1·75–2·5 mm. latum ; sepala lateralia oblique lanceolato-oblonga vel elliptica, basi margine postico valde dilatata, apice acuta vel obtusa, 5–5·5 mm. longa, 1·75–3 mm. lata ; omnia sepala uni- vel trinervia, extra basi interdum pilis furfuraceis sparse obtecta. *Petala* lanceolata vel lanceolato-oblonga, acuta, 4·5–5·75 mm. longa, 1·25–1·75 mm. lata,

trinervia ; omnia tepala patentia vel ± recurvata. *Labellum* ± decurvatum, basi auriculis acute vel obtuse triangularibus instructum, medio vel supra medium trilobatum, totum 4·5–5·75 mm. longum, 5·5–8 mm. latum ; lobus intermedius elongato- vel lineari-triangularis, acutus, 1·75–2·25 mm. longus, basi 0·75–1·25 mm. latus ; lobi laterales divergentes, ± recurvati, quam intermedio satis longiores, lineari-ligulati, versus apicem sensim angustati, apice in fimbrias vel digitos breves irregulariter soluti, 2·5–5 mm. longi ; calcar fere rectum, cylindricum, parte apicali leviter inflatum, 8–9 mm. longum, pilis brevissimis furfuraceis sparsissime praeditum. *Columna* brevis, crassa, 1·25–2·25 mm. longa, androclinio reclinato leviter excavato ; anthera hemisphaerica, antice haud producta ; pollinia ovoideo-globosa, 0·5 mm. diametro, stipite ligulato superne dilatato 0·85 mm. longo, viscidio late lunato antice excavato 0·3 mm. lato ; rostellum breviter productum, acutum ; fovea stigmatica fere orbicularis. *Ovarium* 3–4 mm. longum, leviter sulcatum, pilis brevibus nigris furfuraceis ± dense indutum.

Tanganyika Territory. Paré Mts., coll. P. J. Greenway, cult. Amani, flowered Aug. 1942, *Moreau* 334 ; Uluguru Mts., Lukwangule, 2250 m. alt., in forest, Jan. 1934, *Bruce* 729 (type) ; Lukwangule Plateau, W. side, 2370 m. alt., in dry evergreen forest on *Xymalos monospora*, Jan. 1943, *Moreau* 471 ; same locality, habitat and date, cult. Amani, flowered Feb. 1943, *Moreau* 472.

Another species in the circle of affinity of *T. stipulata* (De Wildem.) Schltr., from which it differs in the characters given in the diagnosis. The long and irregularly divided side-lobes of the lip are a characteristic feature. The specific epithet is given in allusion to the brown anther-cap, the remainder of the flower being green.

18. **Tridactyle cruciformis** *Summerhayes*, sp. nov. ; species distinctissima, foliis linearibus 8–17 cm. longis 1–3 mm. latis, floribus pro genere parvis, labello tepalis 4–5-plo longiore prope basin trilobato, lobis lateralibus horizontalibus vel ± recurvatis facile distinguenda.

Herba epiphytica ; caules penduli, elongati, simplices vel pauciramosi, graciles, superne foliati, usque ad 45 cm. longi, 2–4 mm. diametro, foliorum vaginis fere omnino obtecti, basi radices flexuosas ramosas griseas dense paleaceas 1–2 mm. diametro emittentes. *Folia* 5–20 mm. distantia, disticha ; vagina arcta, compressa, internodio longior vel paulo brevior, leviter longitudinaliter costata, transverse rugulosa ; lamina ± recurvata, linearis vel anguste linearis, apice acuta vel obscurissime acuteque bilobulata, 8–17 cm. longa, 1–3 mm. lata, superne dorso humiliter carinata, pallide viridis, nitida. *Inflorescentiae* solitares, patentes vel decurvatae, graciles, 2–5 cm. longae, 5–13-florae ; bracteae basi vaginantes, late ovatae, obtusae vel subacutae, 1–2·5 mm. longae. *Flores* 2–5 mm. distantes, ± secundi, pallide vel flavidi-virides, anthera interdum brunnea, fragrantes ; pedicellus cum ovario 3–4 mm. longus, gracilis. *Sepalum* intermedium ovatum, obtusum vel subacutum, 2·25–2·75 mm. longum, circiter 1·5 mm. latum ; sepala lateralia oblique ovato- vel late lanceolato-oblonga, acuta, 2·5–3·25 mm. longa, 1·5 mm. lata ; omnia sepala trinervia. *Petala* oblongo-lanceolata, acuta, 2–3 mm. longa, 0·5–1 mm. lata, trinervia ; omnia tepala patentia vel leviter recurvata. *Labellum* patens, dimidio inferiore trilobatum, 2–2·5 mm.

longum, 1·75–2·25 mm. latum ; lobus intermedius rectus, triangulari-oblongus, obtusus, 1–1·5 mm. longus, basi 0·5–0·75 mm. latus ; lobi laterales ex intermedio angulo recto divergentes, superne recurvati, triangulari-ligulati, acuti, margine antico leviter sinuato vel obscure denticulato, 0·6–0·8 mm. longi ; calcar incurvatum, cylindricum, dimidio apicali leviter inflatum apice ipso angustatum, 12–16 mm. longum, pilis brevibus nigris furfuraceis sparsissime praeditum. *Columna* brevis, crassa, circiter 0·75 mm. longa, androclinio horizontali leviter excavato ; anthera fere hemisphaerica, antice in appendice triangulari acuta producta ; pollinia ovoidea, circiter 0·4 mm. longa, stipite communi ligulato superne leviter dilatato 0·55–0·7 mm. longo, viscidio orbiculari ; rostellum deorsum productum, acutum ; fovea stigmatica transverse oblonga. *Ovarium* 3–3·5 mm. longum, leviter sulcatum, pilis brevibus nigris furfuraceis sparse vel subdense indutum.

Tanganyika Territory. East Usambara Mts., Amani, 900 m. alt., rain forest, especially in canopy, common, April 1941, *Moreau* 17 (type) ; same locality, 600–1050 m. alt., in rain forest, cult. Amani, flowered Dec. 1941, *Moreau* 116.

This very remarkable little species is unlike any other member of the genus although it agrees with the genus in nearly all essential features. The long narrow grass-like leaves are characteristic, as is also the shape of the lip. The basal auricles, so obvious in most other species, seem here to be reduced to an obscure thickening of the lip on each side of the spur opening. The side lobes arise nearer the base than in other species, and, starting at right angles, are curved back somewhat, the whole producing a cross-like effect, whence the specific epithet. The column and pollinarium are typical of the genus.

21. **Tridactyle teretifolia** *Schltr.* in Fries, Wissen. Ergebn. Schwed. Rhod.–Kongo–Exped. 1911–12, **1,** Bot. 251, fig. 28 (1916).

Angraecum hislopii Rolfe in Kew Bull. **1920,** 130.

This species seems to be related to *T. tridentata* (Harv.) Schltr. on the one hand and to *T. stipulata* (De Wildem.) Schltr. and its allies on the other. From the former it differs in its much stouter leaves, inflorescences 2–4 cm. long and considerably larger flowers, while the terete or almost terete leaves distinguish it from all species in the latter group. It is now known to extend from Uganda in the north to Angola and Southern Rhodesia in the south. It is a plant of savannah regions whereas *T. tridentata* is a forest species.

22. **Tridactyle armeniaca** (*Lindl.*) *Schltr.* in Beih. Bot. Centralbl. **36,** ii. 143 (1918).

Angraecum armeniacum Lindl. in Edw. Bot. Reg. **25,** misc. 67 (1839).

A. whitfieldii Rendle in Journ. Bot. Lond. **33,** 250 (1895).

Tridactyle whitfieldii (Rendle) Schltr. in Beih. Bot. Centralbl. **36,** ii. 148 (1918).

I have previously made the above reduction in the Flora of West Tropical Africa (**2**, 463 : 1936) but it is repeated here in order to complete the

record. This species is readily distinguished from *T. tridactylites* (Rolfe) Schltr. by its bright orange or vermillion flowers and shorter spur which is markedly thickened in the apical half.

23. **Tridactyle brevicalcarata** *Summerhayes*, sp. nov. ; affinis *T. armeniacae* (Lindl.) Schltr. et *T. kindtianae* (De Wildem.) Schltr., ab utraque foliis minoribus, calcari labello multo breviore, ab hac labelli lobis lateralibus integris, pollinii stipite apice haud bilobato satis differt.

Herba epiphytica : caulis elongatus, pauciramosus, superne foliatus, usque ad 30 cm. longus, circiter 5 mm. diametro, foliorum vaginis omnino obtectus, basi radices flexuosas multiramosas griseas emittens. *Folia* 7–5 mm. distantia ; vagina arcta, leviter compressa, leviter longitudinaliter costata, internodio longior ; lamina suberecta vel erecto-patens, ligulata, basi conduplicata, apice fere aequaliter vel ± inaequaliter bilobulata, lobulis subacutis ad rotundatis obtuse denticulatis longiore usque ad 5 mm. longo, tota 6–11 cm. longa, 7–10 mm. lata. *Inflorescentiae* solitares vel geminae, ± patentes, multiflorae, 2–6 mm. longae ; bracteae breviter ochreatae, ovatae vel fere orbiculares, obtusae, circiter 1 mm. longae. *Flores* 2–4 mm. distantes, albi, fragrantes ; pedicellus cum ovario 2–2·5 mm. longus. *Sepalum* intermedium anguste ovatum vel elliptico-ovatum, subacutum, 2·5–3 mm. longum, circiter 1·5 mm. latum ; sepala lateralia oblique ovata, subacuta, apice dorso leviter carinata, 3–3·5 mm. longa, 1·5–1·75 mm. lata ; omnia sepala trinervia vel subquinquenervia, extra pilis brevibus furfuraceis sparse obsita. *Petala* oblongo-lanceolata, acuta, 2·5–3 mm. longa, circiter 1 mm. lata, marginibus leviter sinuatis, trinervia. *Labellum* basi auriculis carnosis quadratis vel fere subulatis instructum, totum 3 mm. longum, 2–2·75 mm. latum, medio vel paulo supra medium trilobatum; lobus intermedius triangularis, acutus, circiter 1·5 mm. longus, 1·3 mm. latus, quinquenervius ; lobi laterales divergentes, ligulato-angustati, apice acuti, integri, denticulati vel in digitos paucos soluti, 0·5–1·3 mm. longi ; calcar rectum, breve, 0·4–0·8 mm. longum, obtusum. *Columna* brevis, crassa, androclinio horizontali leviter excavato ; anthera hemisphaerica, antice haud producta ; pollinia globosa, 0·3 mm. diametro, stipite inferne lineari superne trapezoideo-dilatato circiter 0·75 mm. longo, viscidio elliptico minuto ; rostellum productum, acutum, viscidio amoto bifidum ; fovea stigmatica quadrata. *Ovarium* 2 mm. longum, leviter sulcatum, pilis brevibus nigris furfuraceis sparse vel subdense obtectum.

Gold Coast. Ashanti, Kumasi, Aug. 1938, *Cox* 98.

Gabon. Upper Ngounyé River, between Kembélé and Ayoumba, by R. Micounzou, Oct. 1925, *Le Testu* 5564 (type).

An interesting species resembling *T. armeniaca* (Lindl.) Schltr. but with smaller leaves and a very short spur. It probably also occurs in the forested regions of Nigeria and the Cameroons.

25. **Tridactyle tridactylites** (*Rolfe*) *Schltr.* in Beih. Bot. Centralbl. **36,** ii. 148 (1918).

Angraecum tridactylites Rolfe in Gard. Chron. ser. 3, **4,** 34 (1888).
Aëranthus deistelianus Kraenzl. in Engl. Bot. Jahrb. **33,** 75 (1902).
Mystacidium ledermannianum Kraenzl. l.c. **51,** 393 (1914).
Tridactyle ledermanniana (Kraenzl.) Schltr. in Beih. Bot. Centralbl. **36,** ii. 146 (1918).

There seems to be little doubt that the above species are all conspecific. This species differs from *T. armeniaca* (Lindl.) Schltr. in the longer spur which is not at all widened in the apical part and the larger much paler coloured flowers which vary in colour from yellowish to pale pinkish often tinged with green.

As in *T. scottellii* (Rendle) Schltr., which has a very similar lip, the side lobes, though usually entire, are sometimes divided at the extreme apex into several short lobes. The general appearance, however, is quite different from that of *T. bicaudata* (Lindl.) Schltr. in which the lateral lobes are always divided into a number of narrow segments.

26. **Tridactyle bicaudata** (*Lindl.*) *Schltr.* Die Orchid. 602 (1914).
Angraecum bicaudatum Lindl. in Hook. Comp. Bot. Mag. **2,** 205 (1837).
A. fimbriatum Rendle in Journ. Linn. Soc. Lond. Bot. **30,** 387, t. 32, fig. 11–13 (1895).
Listrostachys fimbriata (Rendle) Kraenzl. in Engl. Bot. Jahrb. **33,** 74 (1902), in obs.
L. cirrhosa Kraenzl. l.c. 73 (1902).
L. bicaudata (Lindl.) Finet in Mém. Soc. Bot. France, **9,** 51 (1907), excl. tab.
Tridactyle pulchella Schltr. in Engl. Bot. Jahrb. **53,** 602 (1915).
T. fimbriata (Rendle) Schltr. l.c. 602 (1915), in obs.
Angraecum laciniatum Kraenzl. in Vierteljahrsschr. Nat. Ges. Zurich, **74,** 101 (1929).
Tridactyle polychista Schltr. ex Mansf. in Fedde, Repert. Spec. Nov. Beih. **68,** 11. t. 104, fig. 415 (1932), sine descr.

Here again is a widely-spread species which has been described several times from different parts of Africa. The species is characterised by the side lobes of the lip being divided into a number of long slender processes. The number and nature of these processes varies from one plant, or even from one flower, to another, being sometimes simple and in other examples branched several times. All intermediates, however, can be observed, such variation being distributed more or less evenly over the whole range of the species in Tropical Africa. In South Africa the processes are, on the whole, fewer and shorter, but no sharp line can be drawn between these and the tropical specimens. In vegetative characters, especially the length, breadth and texture of the leaves, there is also considerable variation, the South African specimens again having, in most cases, shorter and stiffer leaves. This is probably merely in relation to the generally less favourable climate in the Cape Province since some specimens (e.g. *Burchell* 4553 and *Flanagan* 636) have leaves longer and narrower than many tropical gatherings.

Finet (see reference above) figures the pollinarium as possessing two stipites which are only united at the very base. This is quite at variance with Bolus' drawing in the Orchids of South Africa (**2,** t. 3 : 1911) and with numerous specimens from all parts of Africa which I have examined myself. In all these the stipes is entire although much widened above and is not even divided to the same extent as in *T. tricuspis* (Bolus) Schltr. Finet's drawings must, therefore, either represent a damaged pollinarium or have been made in error from some other species.

The species, as here understood, extends from the Gold Coast eastwards to Uganda and Kenya Colony and then southwards through East Africa to Mozambique, Natal and the coastal regions of the Cape Province as far as the Uitenhage and Knysna Divisions. It has not yet been found in Angola or the western parts of Rhodesia.

T. bicaudata appears to grow in both savannas and mountain forests but is not recorded from the extensive lowland forests of the Congo basin. It is usually an epiphyte but sometimes grows erect on the ground.

In the original account of the genus (Die Orchideen, 601 : 1914) Schlechter mentions three species of *Angraecum* which are to be referred to his genus and provides a short description of *T. bicaudata* since it was known in cultivation. Neither here nor in his later revision does he specifically mention a type species, but *T. bicaudata* is clearly the most appropriate species to be designated as lectotype species, a step which I have taken formally earlier in this account.

28. **Tridactyle truncatiloba** *Summerhayes*, sp. nov. ; affinis *T. gentilii* (De Wildem.) Schltr., a qua floribus majoribus, labelli lobis lateralibus anguste flabellato-truncatis, calcari dimidio apicali fusiformi-inflato, pollinii stipite superne profunde bifido papilloso-rugulosо, viscidio lunato facile distinguenda.

Herba verosimiliter epiphytica, glaberrima ; caulis elongatus, ut videtur dependens, fere ad basin foliatus, foliorum vaginis fere omnino obtectus, usque ad 43 cm. longus, 4–6 mm. diametro, basi radices flexuosas pauciramosas griseas emittens. *Folia* 2–4 cm. distantia, disticha ; vagina arcta, leviter compressa, leviter longitudinaliter multicostata, 2–3·5 cm. longa ; lamina erecto-patens vel suberecta, basi conduplicata, ligulata, oblongo-ligulata vel elliptico-ligulata, apice ± angustata ± inaequaliter bilobulata, lobulis rotundatis vel obtusis interdum paulo incurvatis vel conniventibus denticulato-erosis longiore usque ad 2 cm. longo, tota lamina 14–21 cm. longa, 1·2–3 cm. lata, tenuiter coriacea. *Inflorescentiae* solitares, ± dependentes, 8–18 cm. longae, laxe 6–8-florae ; pedunculus 1·5–3 cm. longus, infra medium vaginis paucis cupularibus 2–4 mm. longis paleaceis instructus ; rhachis teres, 1–2 mm. diametro ; bracteae vaginantes, oblique cupulares, paleaceae, 2–3 mm. longae. *Flores* 1·2–2·5 cm. distantes, pro genere magni, circiter 3–4 cm. diametro, albi ; pedicellus cum ovario 6–10 mm. longus. *Sepalum* intermedium lanceolatum, acutum, circiter 15 mm. longum et 4·5 mm. latum, quinque- vel subseptemnervium ; sepala lateralia oblique curvatim lanceolata, apice acuta dorso carinata, circiter 18 mm. longa et 5·5 mm. lata, septemnervia. *Petala* leviter curvatim lanceolato-linearia, acuta, circiter 16 mm. longa, fere 2 mm. lata, trinervia. *Labellum*

rectum, basi auriculis quadratis 2 mm. longis instructum, medio trilobatum, totum fere 2 cm. longum, circiter 1·5 cm. latum ; pars indivisa anguste obcuneata, 1 cm. longa, superne circiter 6 mm. lata, multinervia ; lobus intermedius lineari-ligulatus, apice acutus, 9 mm. longus, 2·25 mm. latus, trinervius ; lobi laterales ab intermedio leviter divergentes, flabellato-ligulati, apice truncati, angulo exteriore in caudam decurrentes, margine antice obtuse vel truncatim denticulati, angulo interiore incurvatim acuti, 9 mm. longi, apice 7 mm. lati ; calcar ± recurvatum vel sigmoideum, dimidio apicali fusiformi-inflatum, 3·5–4·5 cm. longum, superne 2–3 mm. diametro. *Columna* semi-teres, 5 mm. longa, androclinio reclinato leviter excavato ; anthera hemisphaerica, sulco mediano lato instructa, antice breviter triangulari-producta retusa ; pollinia ellipsoidea, circiter 1·3 mm. longa, stipite inferne ligulato versus basin angustato superne profunde bifido lobis spathulatis papillato-rugosis toto 3·5 mm. longo, viscidio lunato antice rotundato 1·2 mm. lato ; rostellum deflexum, acutum, pollinario amoto bifidum ; fovea stigmatica elliptica. *Ovarium* 5–8 mm. longum, teres, leviter sulcatum.

Gabon. Upper Ngounyé River, Kembélé, Nov. 1925, *Le Testu* 5784 (type) ; same region, Noumbo, Nov. 1925, *Le Testu* 5778.

This striking species is so far only known from Gabon, but I have seen a sterile specimen (*Bequaert* 3663) from Butagu on the western slopes of Ruwenzori which may be conspecific. Both this and *Le Testu* 5778 have smaller leaves than the type, from which alone the description has been been drawn up. Apart from the size of the flowers, which are the largest in the genus, the shape of the lateral lobes of the lip is remarkable. Instead of running out into a single point or being divided into a number of narrow fimbriae, the lobe widens from the base and is then transversely truncate, the outer margin only being continued as a single fimbria or tail, the fimbriae along the truncate edge remaining short and blunt as though bitten off and the inner angle terminating in a short point directed towards the middle lobe. The only other species with a lip at all similar is *T. unguiculata* Mansf., but in that species all the lobes are much shorter and broader, the laterals being flabellate with a denticulate anticous margin. In other respects there is little similarity between the species. In *T. truncatiloba* the stipes of the pollinarium is deeply lobed almost to the middle in which respect it resembles *T. tricuspis* (Bolus) Schltr. and *T. furcistipes* Summerh. This feature is also developed to a less extent in *T. gentilii* (De Wildem.) Schltr. which is apparently the nearest ally of the present species. In *T. gentilii*, however, the floral structure is very similar to that in *T. bicaudata* (Lindl.) Schltr. except that the flowers are much larger and have a spur 3·5–5 cm. long.

30. **Tridactyle latifolia** *Summerhayes*, sp. nov. ; affinis *T. fimbriatipetalae* (De Wildem.) Schltr., a qua foliis latioribus, labello magis trilobato, lobis lateralibus longioribus angustioribusque ut petalis sparse fimbriatis nec dense fimbriato-laceratis, calcari breviore superne leviter inflato facile distinguitur.

Herba verosimiliter epiphytica ; caulis ut videtur dependens vel decurvatus, elongatus, usque ad plus 40 cm. longus, circiter 5 mm. diametro, superne foliatus, inferne foliorum vaginis fere omnino obtectus ;

radices non visae. *Folia* 1·5–2·5 cm. distantia, disticha ; vagina subarcta, 1·5–2·5 cm. longa, teres, dorsiventraliter carinata, leviter longitudinaliter multicostata, transverse rugulosa ; lamina erecto-patens, anguste elliptico-oblonga, basi angustata conduplicata, apice inaequaliter bilobulata, lobulis rotundatis subconniventibus, tota 9·5–12 cm. longa, 1·7–2·5 cm. lata, tenuiter coriacea. *Inflorescentiae* solitares, ± dependentes, graciles, 5–9 cm. longae, interdum leviter fractiflexae, per totam longitudinem floriferae, laxiuscule 8–18-florae ; bracteae parvae, vaginatae, ovatae vel fere orbiculares, obtusae, 1–2 mm. longae. *Flores* 5–8 mm. distantes, rubido-flavi ; pedicellus cum ovario 3–4 mm. longus. *Sepalum* intermedium lanceolato-oblongum, acutatum, apice ipso obtusum, 5·5–6 mm. longum, circiter 1·75 mm. latum ; sepala lateralia oblique lateque curvatim lanceolato-oblonga, obtusa, circiter 5·5 mm. longa et 2·25 mm. lata. *Petala* ligulato-lanceolata, acuminata, marginibus fimbriis vel laceris ± sparse instructa, circiter 5·5 mm. longa et 1 mm. lata ; omnia tepala patentim recurvata, trinervia. *Labellum* patens, basi auriculis quadratis crenatis instructum, medio trilobatum, totum 6 mm. longum et 9 mm. latum ; pars indivisa flabellata vel cuneata, 2 mm. longa ; lobus intermedius ligulatus, sensim angustatus, obtusus, 3 mm. longus, basi 1 mm. latus ; lobi laterales ab intermedio valde divergentes, recurvati, lineari-ligulati, dimidio apicali margine antico in fimbrias irregulares soluti, 4 mm. longi ; calcar incurvatum, cylindricum, versus apicem leviter inflatum, 10–14 mm. longum. *Columna* brevis, crassa, circiter 1,5 mm. longa, androclinio reclinato leviter excavato ; anthera hemisphaerica ; pollinia ovoidea, 0·7 mm. longa, stipite communi basi lineari superne trapezoideo-dilatato plus 1 mm. longo, viscidio parvo orbiculari ; rostellum recurvatim productum, acutum. *Ovarium* 3–3·5 mm. longum, leviter sulcatum, pilis brevibus nigris furfuraceis sparse praeditum.

Gabon. Upper Ngounyé River, banks of River Ighamba, near Kembélé, Nov. 1925, *Le Testu* 5785 (type).

This species has much the same type of leaf (relatively thin and broad) as in *T. fimbriatipetala* (De Wildem.) Schltr., but appreciably broader and therefore the broadest found in the genus. In other general features *T. latifolia* is clearly allied to that species but lacks the remarkable fimbriate-lacerate margins to the whole of the lip and petals. The petals and the lateral lobes of the lip have, however, a few scattered and irregular fimbriae in the distal half.

32. **Tridactyle tricuspis** (*Bolus*) *Schltr.* in Engl. Bot. Jahrb. **53,** 601, 602 (1915), in obs.

Angraecum tricuspe Bolus in Journ. Linn. Soc. Lond. Bot. **25,** 163 (1889).

A. rhodesianum Rendle, l.c. **40,** 208 (1911).

A. frommianum Kraenzl. in Engl. Bot. Jahrb. **51,** 398 (1914).

Tridactyle nyassana Schltr. l.c. **53,** 601 (1915).

T. frommiana (Kraenzl.) Schltr. in Beih. Bot. Centralbl. **36.** ii. 144 (1918).

T. rhodesiana (Rendle) Schltr. l.c. 147 (1918).

Examination of type or authentic material of the above species has convinced me that they are merely variations of one widely spread species which must bear the earliest epithet *tricuspis*. The species is easily distinguished from all other species except *T. furcistipes* Summerh. by the elongated lip which is trilobed some distance above the middle with the middle lobe distinctly longer than the short laterals. The basal auricles are not so marked as in many other *Tridactyles*, being very short, broad and rounded. The exact shape of the lateral lobes varies considerably from plant to plant or even from flower to flower, being sometimes merely a short entire tooth, in other specimens short but more or less denticulate or fingered at the apex, while in yet other examples it is longer, entire and quite acute. As noticed by Bolus, the stipes of the pollinia is forked in the upper part one pollinium being attached to each lobe.

The species as now circumscribed extends from the Usambara Mts. in northern Tanganyika Territory, through that country, Nyasaland and Southern Rhodesia to Natal. No doubt further collecting will fill up some of the present gaps in the known distribution of the species.

33. **Tridactyle furcistipes** *Summerhayes*, sp. nov. ; affinis *T. tricuspi* (Bolus) Schltr. et *T. sarcodanthae* Mansf., ab illa floribus majoribus, labelli lobis lateralibus ± in fimbrias solutis, ab hac floribus vix carnosis, tepalis acuminatis, calcari saepissime breviore superne vix vel haud dilatato differt.

Herba epiphytica ; caulis erectus, crassus, usque ad 18 cm. longus, 5–8 mm. diametro, superne foliatus, inferne foliorum vaginis omnino obtectus, radices flexuosas ramosas laeves griseas 1·5–3 mm. diametro emittens. *Folia* crebra, 5–10 mm. distantia, vaginis imbricatis ; vagina subarcta, longitudinaliter multi-costata, 1–1·5 cm. longa ; lamina ± patens vel leviter recurvata, ligulata, inferne conduplicata, apice inaequaliter bilobulata, lobulis rotundatis interdum incurvatis longiore usque ad 4 mm. longo, tota 7–17 cm. longa, 6–12 mm. lata, tenuiter coriacea. *Inflorescentiae* solitares, ± patentes, 4–12 cm. longae, usque ad 18-florae ; pedunculus brevis, 1–1·5 cm. longus, vaginis paucis ovatis acutis instructus ; rhachis teres, crassiuscula ; bracteae basi vaginatae, deinde reflexae, ovatae vel lanceolato-ovatae, acutae, 2–5 mm. longae. *Flores* 4–12 mm. distantes, viridi-albi vel cremei, deinde aurantiaci ; pedicellus cum ovario 3–4 mm. longus. *Sepalum* intermedium elongato-lanceolatum, apice longe acuminatum, 9·5–11·5 mm. longum, 2·5–4 mm. latum ; sepala lateralia oblique et curvatim lanceolata, acuminata, 10·5–12 mm. longa, 2–3·5 mm. lata ; omnia sepala, ut petala, patentim recurvata, tri- vel subquinquenervia. *Petala* oblique et anguste lanceolata, longe acuminata, 8·5–10 mm. longa, 2–2·75 mm. lata. *Labellum* fere rectum, patens, apice recurvatum, basi auriculis obscuris rotundatis undulatis instructum, medio trilobatum, totum 9–12·5 mm. longum, 2·5–6·5 mm. latum ; pars basalis indivisa oblonga, 4–6·5 mm. longa, 1·75–3 mm. lata, multinervia ; lobus intermedius triangulari-linearis, acuminatus vel sensim angustatus, apice recurvatus, 4·5–6 mm. longus, 0·75–1·25 mm. latus, trinervius ; lobi laterales ab intermedio divergentes, ± falcatim recurvati, ligulati, versus apicem angustati, apice in digitos vel fimbrias breves soluti, 1·5–3 mm. longi ; calcar fere rectum vel leviter sigmoideum, superne vix vel levissime inflatum, 1·4–2·7 cm.

longum. *Columna* subteres, antice excavata, 1·75–3·25 mm. longa, androclinio reclinato leviter excavato ; anthera hemisphaerica, antice truncata vel breviter triangulariter producta ; pollinia ovoidea vel ellipsoidea, 0·75–1 mm. longa, stipite inferne communi basi dilatato supra medium bifido lobis spathulatis in toto 1–1·25 mm. longo, viscidio fere orbiculari majusculo ; rostellum decurvatim productum, apice obtusum, viscidio amoto bifidum ; fovea stigmatica fere orbicularis. *Ovarium* 2·5–3·5 mm. longum, sulcatum, pilis brevibus nigris furfuraceis numerosis praeditum.

Uganda. Mt. Debasien, Karamoja, 2550 m. alt., very common in scrub, May 1939, *Thomas* 2953A ; same locality, 2640 m. alt., common epiphyte on *Faurea*, etc., May 1948, *Eggeling* 5813.

Kenya Colony. Elgeyo, Theunissen's Farm, 2400 m. alt., at forest edge, April 1943, *Bally* 2538 ; Elgeyo Escarpment, June 1943, *Copley* 116 ; Aberdare Mts., Kinangop, 2640–2670 m. alt., on small tree near river, April 1938, *Chandler* 2401 (type) ; same locality, 2520 m. alt., on cedar tree, May 1932, *Harvey* 183 ; Molo, 2400 m. alt., coll. W. V. Harris, cult. Amani, flowered Jan. 1943, *Moreau* 380.

Clearly a wide-spread species at high altitudes in the highlands of Kenya and eastern Uganda. It is remarkable that it has not, as yet, been found on Mt. Elgon. The species is rather like a large edition of *T. tricuspis* (Bolus) Schltr., but as the flowers are considerably larger and the geographical distributions distinct I think they are best kept separate. *T. furcistipes* is also near *T. sarcodantha* Mansf. but this species, of which I have only seen fragments in the Brussels Herbarium, has fleshier more obtuse flowers with the spur much inflated towards the apex.

The stipes of the pollinarium, as in *T. tricuspis*, is forked in the upper half one pollinium being attached to each fork ; the specific epithet is given in allusion to this character.

Nephrangis (*Schltr.*) *Summerhayes*, gen. nov.

Sepala et petala patentia, sepalis lateralibus basi breviter connatis exceptis libera ; sepala ovata vel fere orbicularia, obtusa ; petala multo angustiora, lanceolata. *Labellum* ex ungue angusto utrinque rotundato-dilatato calcarifero reniformi-dilatatum, antice profunde excisum sinu acuto, lobis ellipticis ; calcar fere rectum, ex ore latiusculo sensim angustatum. *Columna* apoda, brevis ; androclinium horizontale, leviter excavatum ; rostellum productum, porrectum, apice breviter recurvatum, primum indivisum, viscidio amoto bifidum. *Anthera* cucullata, hemisphaerica, antice in rostrum latum obtusum producta ; pollinia 2, ellipsoidea, stipitibus 2 distinctis brevibus spathulato-ligulatis, viscidio communi rotundato-triangulari antice truncato instructa.

Planta epiphytica ; caulis elongatus, superne bene foliatus ; folia disticha, acicularia, teretia ; inflorescentiae solitares vel geminae, racemosae, breves, pauciflorae, bracteis minutis ; flores parvi, pallide brunnei vel brunneo-virides, translucentes.

Species unica Africae tropicae indigena—*Tridactyle* Schltr., sub-genus *Nephrangis* Schltr. in Beih. Bot. Centralbl. **36,** ii. 143, 148 (1918).

N. filiformis (*Kraenzl.*) *Summerhayes*, comb. nov.

Listrostachys filiformis Kraenzl. in Engl. Pflanzenw. Ost.-Afr. **C,** 158 (1895).

Tridactyle filiformis (Kraenzl.) Schltr. l.c. 148 (1918).

Belgian Congo. Parc National Albert, Kibumba, ± 2000 m. alt., in mountain forest, Feb. 1945, *Germain* 3603 ; Njavekesi Mts., S. of Lake Edward. *Stuhlmann* 2299 (type).

Uganda. Bunyoro, Budongo Forest, Aug. 1935, *Eggeling* 2143 ; same locality, May 1944, cult. and flowered at Busingiro, Aug. 1944, *Eggeling* 5380.

N. Rhodesia. Solwezi District, Kasempa Road at Solwezi, in *Brachystegia* woodland, in fruit, June 1930, *Milne-Redhead* 462 ; Kansanshi, dam at reservoir, in *Brachystegia* woodland, flowered at Matonchi Farm, March 1938, *Paterson in Milne-Redhead* 4652 ; Mwinilunga District, between Rivers Dobeka and Kasompa, in *Cryptosepalum* woodland, on upper branches of 18 m. high *Cryptosepalum pseudo-taxus*, Feb. 1938, *Milne-Redhead* 4425, 4425A.

In his account of the genus *Tridactyle* Schlechter places *T. filiformis* in a special sub-genus *Nephrangis* which he suggests may eventually prove to be a distinct genus (see reference above). He had available only Stuhlmann's original gathering which, as he points out, had mostly gone over flowering. I have now had the opportunity of examining a half-a-dozen gatherings from widely separated localities, including in several cases material in liquid preservative. This material confirms Schlechter's view and I am therefore raising his sub-genus to generic rank. In addition to the remarkable lip-shape, which is not found elsewhere in the Angraecoid orchids, and the absence of the basal auricles so characteristic of *Tridactyle*, the pollinarium is quite different from that in *Tridactyle* proper. In *Nephrangis* there are two separate short stipites attached to a relatively large viscidium, whereas in *Tridactyle* the single stipes, though sometimes quite deeply bilobed in the upper part, is nearly always long compared with the size of the viscidium and pollinia.

Records up to date show that the species is found in several places in the highlands of the Belgian Congo and Uganda and also in North-western Rhodesia. In the latter region it is a member of the forest-canopy flora and this may explain why it had not been found in many places until comparatively recently. No doubt the species will be found elsewhere in East Africa as exploration of the forests is carried out more fully. In the vegetative state it is difficult to distinguish the species from the var. *subulifolia* of *Tridactyle tridentata* (Harv.) Schltr.

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XLVIII*.

Notable Additions to the Flora of British Guiana.

N. Y. Sandwith.

The descriptions and new records which follow are based on the remarkable collections which were made in British Guiana during the war by Mr. D. B. Fanshawe, Assistant Conservator of Forests.

Violaceae

Paypayrola grandiflora *Tul.* in Ann. Sci. Nat. Sér. 3, 7, p. 371 (1847).

Bartica-Potaro road, 108 miles at Mahdia Creek, June 30th, 1942, *D. B. Fanshawe* in *Forest Dept.* no. 3497 ; *ibid.*, at 107 miles, Nov. 12th, 1943, *id.* in *Forest Dept.* no. 4195. A shrub or small tree from Kakaralli—Clump Wallaba forest. Flowers creamy or yellow-green, the corolla lobes fleshy and scarcely opening. Fruit glossy, green, with thin, bony endocarp and angular seeds.

Distr. Amazonian Brazil and Peru. First record for British Guiana.

Polygalaceae

Securidaca spinifex *Sandwith*, sp. nov. ; *S. pubiflorae* Benth. ut videtur affinis, stipulis elevatis tumido-conicis spinescentibus, costa foliorum supra haud dense puberula, reticulatione supra satis immersa nec intricatissima prominula, sepalis interioribus (alis) majoribus orbiculari-ovatis ciliatis, ovario dense pubescenti-tomentoso differt.

Frutex scandens, caule 2–3 cm. diametro ; ramuli teretes, petioli, inflorescentiae pedicellique omnes pilis inaequalibus patentibus vel crispule ascendentibus dense induti. *Folia* elliptica vel elliptico-ovata, apice acuta vel obtusa, nonnunquam brevissime cuspidatula, basi rotundata, sub inflorescentiis 6–10 cm. longa, 3–5 cm. lata, apud inflorescentias minora, coriacea, marginibus pubescentibus revolutis, supra nitida glabrata vel obscure sparse pubescentia, subtus pallidiora copiose breviter adpresse pubescentia, costa supra canaliculato-impressa subtus prominente, nervis primariis utroque costae latere 6–8 patulis satis longe a margine anastomosantibus, reticulatione supra plus minusve immersa sed obvia subtus prominula sed laxa venulis ultimis satis immersis ; petiolus 5–6 mm. longus, basi stipulis binis flavido-brunneis elevatis tumido-conicis spinescentibus 1–2·2 mm. longis basi 0·5–1·5 mm. latis apice umbilicato-glanduliformibus praeditus. *Paniculae* axillares atque terminales, speciosae, pyramidales, ramis saepe 10–15 cm. longis ; bracteae concavae, 2–3 mm. longae, basi glandulis tumido-conicis stipulis similibus sed multo minoribus praeditae ; pedicelli 3–3·5 mm. longi. *Flores* purpurei. *Sepalum* exterius posticum valde concavum, ovatum, obtusum, 4·5 mm. longum, 3·5 mm. latum, extra pubescens ; 2 antica ovato-orbicularia, 3·2–4 mm. longa, obtusa, 3·3–3·75 mm. lata, extra pubescentia ; alae ungue 1·5–2 mm. longo, lamina orbiculari-ovata, 9 mm. longa atque lata, emarginata, ciliata, extra undique nisi prope margines pubescente intus glabra. *Petala* lateralia

* Continued from K.B. 1948, 235.

spathulata vel spathulato-oblonga, late leviter emarginata vel rotundata, ad 8·5 mm. longa, 3·7 mm. lata, glabra, dente laterali anguste deltoideo circiter 0·75 mm. longo ; carina tota 1 cm. longa, ungue 2·5 mm. longo, glabra, crista 1 mm. tantum alta fere 4 mm. lata subintegra irregulariter denticulato-crenata. *Staminum* vagina 7 mm. longa, medio ciliata ac intus praesertim margines versus dense pubescens ; filamenta libera ad 3 mm. longa ; antherae circiter 0·8 mm. longae. *Ovarium* ovoideo-oblongum, circiter 1·5 mm. longum atque diametro, dense adpresse pubescenti-tomentosum, stipite glabro 0·5 mm. longo, stylo curvato glabro cum stigmate integro 8 mm. longo. *Fructus* jam juvenis immaturus obovatus, rugosus, ala subfalcato-oblonga apice rotundata, totus griseo-tomentosus.

British Guiana. Mazaruni River : Takutu Creek to Puruni River, Oct. 26th, 1944, *D.B. Fanshawe* in *Forest Dept.* no. 4789 (typus in Herb. Kew.). " Creamy brown soft rope from crown of an *Eschweilera* in Morabukea forest, 2–3 cm. diam., partly flattened. Leaves thinly fleshy, pale below, stipules spiny. Flowers in large terminal inflorescences, upper branches purple. Calyx dusky purple. Petals purple ; keel flushed whitish centrally. Ovary pubescent, purple. Young fruit obovate, wrinkled, purplish, surrounded on two sides with a greenish-purple wing, all pubescent."

This plant is remarkable for the spinous development of the stipular glands, a condition recognised in several species of *Securidaca* by Chodat (see Engler and Prantl, Pflanzenfam., III. **4**, 325 (1896)) and approached in such species as *S. gardneri* Chod., *S. warmingiana* Chod. and *S. rivinifolia* St. Hil. In the character of the external silky pubescence of the wing sepals, and in the facies of the inflorescence, the affinity is evidently with *S. pubiflora* Benth. and *S. orinocensis* Rusby. The present writer cannot agree with the reduction of *S. pubiflora* to *S. diversifolia* (L.) Blake by Dr. Oort, in Rec. Trav. Bot. Néerl. **36,** 680 (1939) : whatever may be said of the type of *S. latifolia* Benth., it is wholly incorrect to state that the type of *S. pubiflora* (*Schomburgk* 714) only differs from the other specimens of *S. diversifolia* by the extraordinary large size of the leaves. It seems likely that Dr. Oort has dismissed too hastily the probability of the existence of good diagnostic characters in the flowers of species of this genus. *S. pubiflora* in reality is related to *S. longifolia* Poepp. & Endl., to which it was reduced by Bennett, and to *S. orinocensis*. It may indeed be conspecific with *S. longifolia* (see Sprague in Kew Bull. **1931,** 174), but a new comparison with the type of the latter is needed. Meanwhile *S. spinifex*, apart from its spinous stipules, is clearly differentiated from both *S. pubiflora* and *S. orinocensis* by characters of the leaves, the shape of the wing sepals, and the tomentose ovary.

Bombacaceae

Scleronema guianense *Sandwith*, sp. nov. ; *S. grandifloro* Huber ut videtur affinis, petiolis longioribus, foliis majoribus apicem versus attenuatis atque conspicue cuspidato-acuminatis, calyce 3–4-lobo, stylo stamina longe superante differt ; a *S. spruceano* Bth. foliis majoribus nervis lateralibus numerosioribus, petiolis pedunculisque multo longioribus, floribus majoribus albis facile distinguitur.

Arbor excelsa, ramulis petiolisque glabratis, gemmis pallide fulvo-tomentellis. *Folia* plantarum incipientium simplicia, elliptica, ovato-elliptica vel ovato-oblonga, apice longe (2–5 cm.) anguste caudato-acuminata, basi rotundata vel cuneata, 11–20 cm. longa, 4–8·3 cm. lata, chartacea, costa nervisque subtus sparse stellato-puberulis, ceterum glabra ; adulta etiam simplicia, elliptica vel obovato-elliptica, apice attenuata ac argute 0·6–1·2 cm. cuspidato-acuminata, basi rotundata vel rarius cuneata, 10·5–20 cm. longa, 5–8·5 cm. lata, coriacea, supra nitidula siccitate brunneo-plumbea, costa nervisque primariis subtus sparse stellato-puberulis ceterum glabra, basi trinervia, costa utrinque praesertim subtus elevata, nervis primariis utroque costae latere 8–10 ascendentibus arcuatis vel subrectis marginem versus anastomosantibus supra planis subtus prominentibus, nervis secundariis venulisque regulariter subparallelis intricate reticulatis supra obscuris vel immersis subtus conspicuis prominulis ; petiolus 3–6 cm. longus, apicem versus incrassatus. *Flores* in quaque axilla 1–3 ; pedicelli 2–3·8 cm. longi, pilis stellatis pallide fulvis dense pubescentes ; bracteolae 3 apice pedicelli sub calyce insertae, mox deciduae, deltoideo-ovatae, 2 mm. longae, 1·5–1·8 mm. latae, indumento pedicelli praeditae. *Calyx* totus 9 mm. longus, tubo campanulato 5–6 mm. diametro extra indumento stellato siccitate ochraceo-fulvo tomentello intus sericeo-piloso ; lobi 4, rarius 3, subaequilongi, reflexi, deltoideo-ovati, circiter 4 mm. longi, 2·5–4·5 mm. lati, extra stellato-tomentelli intus sparse adpresse pilosi. *Petala* 5, alba, reflexa, anguste elliptico-linearia vel lineari-oblonga, obtusa, 1·3–1·5 cm. longa, 3–4 mm. lata, apicem versus ciliata ceterum glabra, basin versus attenuata incrassata magis concava subunguiculata. *Stamina* glabra, 20–30, tubo 3–4 mm. longo, filamentis inaequalibus ad 7·5 mm. longis more generis apicem versus dilatatis incrassatis claviformibus ; antherae more generis filamentis per totam longitudinem incumbentes, loculo circiter 0·6 mm. longo. *Ovarium* 2-loculare, loculis 2-ovulatis, subglobosum, 1·5 mm. altum, 2 mm. diametro, tomentellum ; stylus circiter 1·8 cm. longus, stamina longe superans, basi excepta glaber, stigmatibus 0·2–0·7 mm. longis. *Fructus* late globosus, jam maturus 6–8 cm. longus atque diametro, exocarpio crasso statu vivo flavo-brunneo, siccitate brunneo, tomentello, crebre irregulariter late obtuse rugoso-costato ; semina teste lectore unica usque ad compluria, globosa vel angulata, testa rugis elevatis reticulata, ad 5·5 cm. diametro.

British Guiana. Bartica-Potaro road, 107 miles, in Clump Wallaba (*Dicymbe*) forest by creek, fl. and fr. Nov. 15th, 1943, *D.B. Fanshawe* in *Forest Dept.* no. 4227 (typus in Herb. Kew.). "Tree 100 ft. high, 16 in. diam., unbuttressed. Leaf lamina held at an acute angle to the petiole. Flowers 1–3 per axil. Calyx orange-tomentose, lobes reflexed. Corolla lobes white, reflexed. Stamens erect. Ovary white. Young fruit greenish orange, velvety, curved. Ripe fruit broadly globose, rough-ribbed, yellow-brown. Seeds 1 to many, from globose to angular." Seedlings collected from below parent tree, as above, Nov. 14th, 1943, *Forest Dept.* no. 4219. Seedlings from same tree grown in forest nursery at Mazaruni Station, 3 weeks and 5 months old, *Forest Dept.* no. 4953.

Vernacular name (Arawak), *Baromalli* (cf. *Catostemma* spp.).

Scleronema was reinstated by Ducke as " a well-defined independent genus and not a mere section or subgenus of *Catostemma*," see "Tropical Woods," no. **50,** p. 37–39 (1937). He gave comparative diagnoses of the three genera composing the subfamily *Catostemmateae*, viz. *Scleronema* Bth., *Catostemma* Bth. and *Aguiaria* Ducke, and quoted a statement of Prof. Record that they were readily separable by their wood (cf. Record in " Tropical Woods", no. **59,** p. 20 (1939)). The present writer, after a comparison of all the available material of *Scleronema* and *Catostemma*, considers that the only distinguishing characters of generic significance are to be found in the stamens, but that these are sufficiently striking to warrant the separation of the two genera. He is not satisfied with the validity of the fruit characters given by Dr. Ducke, on account of the evidence afforded by fruit of *Catostemma* received from British Guiana ; but further field information on this point is needed. Meanwhile Mr. Fanshawe writes (January, 1948) that the fruits of *Scleronema* are globose or subglobose with many seeds, while those of *Catostemma* are conical with one seed.

The five known species of *Scleronema* are probably ill-defined and might well be treated as provisional, pending further collections and field observations. Ducke provided a key to the four hitherto described species, at a time when he accepted the reduction of the genus to *Catostemma* (see Arch. Jard. Bot. Rio de Janeiro, **5,** 165), and added further comments a few years later (*ibid.*, **6,** 66). The colour of the flowers of the type tree of Bentham's original species, *S. spruceanum*, was unknown to Ducke, but Spruce's manuscript field notes record the flowers as " saturate rubri". The white-flowered species are *S. grandiflorum* Huber, *S. micranthum* (Ducke) Ducke and *S. guianense*. *S. grandiflorum* differs from *S. guianense*, according to Huber's description and Ducke's notes, in its shorter petioles (1–3 cm.), its leaves which are up to 10 cm. long and 6 cm. broad, rounded or emarginate at the apex, its 5-lobed calyx, and in its style which equals the stamens. *S. micranthum*, which has a 3-lobed calyx, seems very distinct from *S. guianense* on account of its leaves which are obtuse or rounded, or only slightly shortly acuminate, at the apex, the short (1–1·5 cm.) pedicels and the short (up to 9 mm.) petals. As *S. micranthum* sometimes bears rose-coloured flowers (*Herb. Jard. Bot. Rio de Janeiro* no. 35,198), it is possible that the colour of the petals of these species is of no diagnostic importance ; while the same may be true of the number of calyx lobes, and still more so of the apex of the leaves.

Rutaceae

Cusparia fanshawei *Sandwith*, sp. nov. ; *C. trombetensi* Ducke affinis, ramulis petiolis inflorescentiisque pubescentibus, foliolis oblanceolatis, nervis secundariis inter primarios regulariter subparallelis, forma inflorescentiae, petalis inferne satis longe coalitis differt.

Arbor parva, usque ad 5 m. alta ; ramuli ultimi tenuiter pluricostati, apice rufescenti-pubescentes. *Folia* apice ramulorum conferta, 1-foliolata; petiolus 1–2 cm. longus (nonnunquam longior ?), subteres sed supra applanatus, basi et praesertim apice infra tumescenti-incrassatus, rufescenti-pubescens, demum glabratus ; petiolulus a foliolo vix distinguendus, marginatus ; foliolum oblanceolatum, apice in cuspidem conspicuam satis angustam ad 2 cm. longam contractum, basin versus longe attenuatum basi ipsa acute anguste cuneatum, 15–30 cm. longum, 4–12

cm. latum, firme chartaceum vel tenuiter coriaceum, utrinque nitidulum, siccitate supra nigrescens, oculo nudo glabrum sed costa nervisque lateralibus rufo-pubescentibus demum glabratis, praeterea pagina inferiore sub lente forti pilis minutis adpressis sparse sed regulariter induta, glandulis crebris subtus obviis conspersum, costa utrinque praesertim subtus prominente, nervis lateralibus primariis utroque costae latere 12–16 supra planis subtus prominentibus ascendentibus marginem versis arcuato-anastomosantibus, nervis secundariis a primariis angulo fere recto regulariter discedentibus subparallelis subrectis vel haud valde sinuosis subtus prominulis, venulis laxe reticulatis satis obscuris. *Inflorescentia* solitaria, pseudoterminalis, 20–27 cm. longa, triente vel quadrante superiore tantum florifera, passim breviter adpresse nisi sub lente satis obscure rufescenti-pubescens, cremeo-lenticellata, thyrso florifero ipso angusto simpliciter racemiformi, cymis simplicibus secus axin fere sessilibus, praeterea flore cymae cujusque terminali quam lateralibus multo praecocius evoluto ; pedicelli 2–5 mm. longi. *Calyx* cupularis, 4 mm. longus, fere 6 mm. latus, dense pubescens atque nigro-glandulosus ; dentes irregulares, deltoideo-triangulares, acuti, ad 1 mm. longi, ad 2 mm. lati. *Corolla* statu vivo viridi-cremea ; petala 5, inferne in tubum 3–4 mm. longum extra sordide flavescenti-griseo-tomentosum intus glabrum vel sparse minute puberulum coalita, laminis liberis oblongis flore plane aperto 8–9 mm. longis 2·5 mm. latis demum reflexis tomento extra sordide flavescenti-griseo intus albido-griseo indutis. *Stamina* 5, omnia perfecta, prope apicem corollae tubi inserta ; filamenta late spathulato-oblonga, 2–3 mm. longa, sursum antice dense rufo-villosa, apice in stipitem filiformem in connectivum transeuntem post antherae lapsum ad 1·5 mm. longum subito contracta ; antherae oblongae, alabastro ad 3·5 mm. longae (flore aperto unico viso delapsae). *Discus* 1 mm. altus, 2·5 mm. latus, satis crassus, extra rugosus, utrinque glaber, siccitate nigrescens. *Ovarium* disco primo inclusum, demum superans, apice umbilicatum, carpellis brunneis glabris plus minusve inaequalibus ad 1 mm. longis ; stylus flore aperto 8 mm. longus, glaber, minute glanduloso-punctatus, stigmate capitato minute lobulato. *Cocci* fructus 1–5 evoluti, late mituliformes, obovato-oblongi, compressi, ad 1·5 cm. longi, circiter 1 cm. lati, apice rotundati, utroque margine praesertim dorsali carinati, transverse costati, praesertim basin versus puberuli, crebre glanduloso-verruculosi, endocarpio soluto flavo-cremeo ; semina statu vivo alba, oblongo-reniformia, 8–9 mm. longa.

British Guiana. Potaro River : Mahdia Creek, at 108 miles on Bartica-Potaro road, June 29th, 1942, *D. B. Fanshawe* in *Forest Dept.* no 3494 (typus in Herb. Kew.). " Undergrowth tree to 15 ft. high, of irregular growth, very common in Kakaralli-Clump Wallaba (*Eschweilera-Dicymbe*) bush on lateritic ironstone soil. Leaves chartaceous, rugose, tufted at the ends of the branches. Buds green, striped grey. Flowers greenish-cream, flowering one at a time. Fruits 1–4 on disk, beanshaped, green speckled with white. Seed white, partly covered by whitish, bivalved, bony endocarp which is free from the seed case." Conawarook River, Sept. 1905, *A. W. Bartlett* in *Jenman Herb.* no. 8240: in this collection the dehisced cocci are smaller, 1·2 cm. long and 8 mm. broad. Bartlett noted that the Indians call this tree " Hackia " and use it for fishing rods.

C. trombetensis Ducke, of which there is a sheet of the type number at Kew, is evidently closely allied to Mr, Fanshawe's new species, but differs from it especially in the glabrescence of all parts except the flower-bearing portion of the inflorescence, in the elliptic-lanceolate leaflet (which has dried green) with irregularly reticulate secondary and tertiary venation, and in the corymbose flower-bearing branchlets at the top of the inflorescence. In addition, the petals of *C. trombetensis* appear to be free nearly to the base, the anthers longer than those of *C. fanshawei*, the disk thinner and straw-coloured, and the young cocci puberulous at the apex ; but such characters must be tested by comparison of fully developed corollas from each species.

Pilocarpus demerarae *Sandwith*, sp. nov. ; foliis impari- vel paripinnatis foliolis 1–4-jugis acuminatis, floribus brevissime pedicellatis valde distincta, *P. grandifloro* Engl. forsan affinis.

Arbor parva, ramulis glabris pallidis griseis crebre tenuiter costatis. *Folia* alterna, glabra, magna, impari- vel paripinnata, maxima ad 50 cm. longa, rarius trifoliolata breviora circiter 16 cm. longa ; petiolus 5·5–13 cm. longus, supra applanatus ; internodia rhacheos 3·5–6·5 cm. longa ; petioluli 4–8 mm. longi ; foliola 1–4-juga, elliptico-oblonga, apice semper acuminata acumine 0·5–1 cm. longo apice obtuso atque retuso, basi cuneata decurrentia saepius inaequilatera, 9 (5·5)–18 cm. longa, 3 (2)–6·5 cm. lata, firme chartacea, supra saepe plus minusve rugosa vel subbullata, crebre pellucido-punctata, siccitate olivacea, costa utrinque praesertim subtus prominente, nervis primariis utroque costae latere circiter 10 angulo lato patulo-ascendentibus marginem versus arcuato-anastomosantibus subtus prominulis, intermediis parallelis e costa exeuntibus perobviis et primo a primariis vix distinguendis, rete venularum haud conspicuo. *Racemi* terminales vel laterales, spiciformes, flexuosi, longissimi, 35–85 cm. longi, fere per totam longitudinem floriferi, rhachi 1·5–3 mm. diametro sub lente forti minute furfuraceo-puberula ; pedicelli 2 mm. longi, ad 1·3 mm. crassi, sursum curvati, minute puberuli ; bracteolae sub calyce ovatae, obtusae, minutae. *Calyx* 1·5 mm. vix attingens, 2 mm. latus, tubo brevi obscuro, dentibus deltoideo-ovatis 0·5 mm. longis ad 1·2 mm. latis. *Petala* 5, maturitate reflexa, flavo-viridia basi purpurascentia, valvata, ovato-elliptica, apice mucrone inflexo praedita, applanata ad 2·5 mm. longa et ad 1·5 mm. lata, glabra. *Stamina* 5 infra discum inserta, filamentis subulatis glabris ad 1·2 mm. longis, antheris ovatis ad 1·2 mm. longis. *Discus* annulari-patelliformis, satis obscurus planusque nec ovarium obtegens. *Ovarium* glabrum, disco insidens, carpellis ad 0·75 mm. longis, stylo haud obvio stigmate capitato orbiculari-ovato 0·5 mm. lato angulato-quinquelobato. *Fructus* pedicello 5 mm. longo sustentus ; cocci orbiculari-ovoidei, vix 1·5 cm. longi atque lati, costis concentricis striati necnon glanduloso-verruculosi atque sub lente minute papilloso-puberuli ; endocarpium solutum flavescens ; semina reniformia, nitida, statu vivo rubro-brunnea, vix 1 cm. longa.

British Guiana. Mazaruni River : Takutu Creek to Puruni River, Oct. 31st, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4801 (typus in Herb. Kew.). " Tree 30 ft. high, 4 in. diam., from ropy mixed forest ; leaves

chartaceous, somewhat rugose, glabrous ; inflorescences axillary or lateral, green, glabrous ; flowers stalked, sepals green ; petals yellow-green, reflexed, purplish at base ; stamens curved over ovary and discoid stigma ; fruits green, of 1–4 carpels, striated, ovoid, bony, black-brown and dehiscent when ripe ; seeds reniform, red-brown, glossy."

The combination of glabrous, alternate, pinnate leaves and conspicuously acuminate leaflets with small flowers on extremely short pedicels and with glabrous ovaries has been quite unknown hitherto in the genus *Pilocarpus*. Of possible allies, *P. grandiflorus* Engl. and *P. pennatifolius* Lem. both have obtuse leaflets and larger flowers on longer pedicels, while the former also has 6 pairs of leaflets and a densely ferrugineous-pilose ovary, and the latter up to three pairs of leaflets and much smaller fruits. Other species with very shortly pedicelled flowers either have simple leaves arranged in the form of whorls, or a conspicuous indumentum on the foliage and inflorescence.

Erythrochiton brasiliensis *Nees et Mart.* in Nov. Act. Nat. Cur. **11,** 170, t. 25 (1823).

Keriti Creek, Essequibo River, Sept. 19th, 1942, *D. B. Fanshawe* in *Forest Dept.* no, 3590 : shrub or low tree single-stemmed to 12 ft. high, with leaves tufted at apex; peculiar to one rocky hill top with lateritic soil and there abundant ; calyx pink-scarlet ; corolla white ; fruit sepia-coloured, wrinkled ; seed black, tuberculate, with white kernel.

Distr. Surinam, Brazil, Amazonian Peru and Bolivia. First record for British Guiana.

A strikingly handsome and unusual shrub, long known in cultivation (see Bot. Mag. t. **4742**).

Meliaceae

Guarea concinna *Sandwith,* sp. nov. ; prope *G. macrophyllam* Vahl atque *G. paraënsem* C. DC. ponenda, ab illa foliolis pro rata minoribus apice conspicuius abrupte anguste cuspidatis, basi in petiolulum magis angustatis decurrentibus, nervis lateralibus paucioribus, inflorescentia gracili longius ramosa, floribus longius pedicellatis, disco brevi apice haud expanso, ovario villoso haud pubescente costato sulcatoque, stylo tenui laevi basi excepta glabro, fructu juniore minus pyriformi haud costulato differt ; ab hac floribus longius pedicellatis, tubo staminali antherisque brevioribus, disco brevi, ovario ovoideo villoso nec sericeo, stylo basi excepta glabro facile distinguitur. *G. demerarana* C. DC. e descriptione tantum cognita foliolis coriaceis brevissime obtuse cuspidatis utrinque glabris, nervis lateralibus utroque costae latere circiter 12, floribus breviter pedicellatis, stylo hirsuto satis differe videtur.

Arbor parva ramulis ultimis pallide cinnamomeis vel griseis costato-striatis oculo nudo glabratis vel minute puberulis ; gemmae pilis flavescentibus dense villoso-tomentosae. *Folia* summa circiter 20 cm. longa, petiolo rhachique supra applanato-sulcato pubescente vel glabrato; petiolus 1·4–3·2 cm. longus ; internodia rhacheos 1·5–4·5 cm. longa ; petioluli 1·5–3 mm. longi ; foliola 2–4-juga, elliptica vel obovato-elliptica, apice abrupte saepius caudatim anguste per 0·5–1·8 cm.

cuspidata, basi attenuata demum saepius abruptiuscule acute cuneata ac in petiolulum decurrentia, 6–14 cm. longa, 4–6·4 cm. lata, chartacea, utrinque nitidula, secus costam nervosque primarios supra minute puberula subtus pilosula, ceterum supra glabra subtus sub lente pilis minutis adpressis sparsis praedita, costa supra plana vel canaliculata subtus prominente, nervis primariis utroque costae latere 8–10 (obviis vulgo 8) supra planis subtus prominentibus, reticulatione venularum valde intricata utrinque praesertim subtus prominula. *Inflorescentia* ex axillis foliorum oriens, singula, gracilis, elongata, 15–44 cm. longa, undique pubescens, racemiformis simplex vel elongato-pyramidalis ramis inferioribus gracilibus saepe flexuosis 4–11 cm. longis ; pars basalis nuda 3–8 cm. longa ; bracteae ovatae vel ovato-lanceolatae, 1·5–3 mm. longae ; bracteolae dimidio minores ; pedicelli satis graciles, 3–4·5 mm. longi. *Calyx* statu vivo puniceus, 1·75–3·5 mm. altus, 4–4·5 mm. latus, profunde (usque ad dimidium vel fere ad basin) fissus in lobos 2 ovatos ad 2 mm. longos ad 3·3 mm. latos extra adpresse pubescentes intus glabros ; lobi ipsi saepius usque ad tertiam partem vel dimidium in lobos alteros 2 ovatos apice barbellatos divisi. *Petala* 4, oblonga, 8–9 mm. longa, 1·5—2·5 mm. lata, apice incrassata obtusa vel acutiuscula, extra albido-sericeo-pubescentia intus glabra. *Tubus staminalis* 6·5–7 mm. longus, 3 mm. latus, glaber, plus minusve 4-costatus atque quadrangularis, ore integro nisi apicibus costarum breviter productis ; antherae 8, intus infra tubi apicem affixae sessiles, glabrae, fere 1 mm. longae. *Discus* gynophorus 0·6 vel vix usque ad 1 mm. longus, glaber, apice haud dilatatus. *Ovarium* ovoideum, 1·5 mm. longum, circiter 1·3 mm. diametro, flavescenti-villoso-tomentosum, 4-loculare, loculis uniovulatis ; stylus basi excepta glaber, tenuis, laevis, 4 mm. longus, stigmate capitato-discoideo. *Fructus* globoso-pyriformis, maturus haud visus, junior visus ad 1·3 cm. longus ad 1·2 cm. diametro, griseo-tomentellus pilis subadpressis praesertim prope basin immixtis.

British Guiana. Tumatumari, in dense upland forest, fl. June 18th-July 8th, 1921, *H. A. Gleason* 443 (typus in Herb. Kew.) ; shrub 12 ft. high. Bartica-Potaro road, at 115 miles, fl. and young fr. Jan. 25th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 3845 : small second growth tree, locally common on lateritic ironstone soil ; leaves chartaceous ; flowers in long axillary spikes set far apart ; calyx crimson ; corolla creamy ; fruit grey-green, trigonal to globose, pubescent.

French Guiana. Without locality or date, with young fruit, *Martin*.

Leguminosae

Alexa wachenheimi *R. Ben.* in Bull. Mus. Hist. Nat. Paris, **27,** 115 (1921) ; Amshoff in Pulle, Fl. Surinam, **2** (2), 34 (1939).

Madray Landing, Essequibo River, Feb. 5th, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4430 : tree 100 ft. high, 16 in. diam., unbuttressed, from mixed bush on brown sand ; flowers in thick spikes ; pedicels and calyx velvety dark brown ; flowers white, large petal streaked purple inside ; young fruit velvety dark brown.

Distr. Surinam, French Guiana. First record for British Guiana.

Ormosia paraënsis *Ducke* in Arch. Jard. Bot. Rio de Janeiro, **4,** 62 (1925) ; Amshoff in Pulle, Fl. Surinam, **2** (2), 111 (1939).

Essequibo River : Moraballi Creek, April 17th, 1940, *D. B. Fanshawe* in *Forest Dept.* no. 3200 ; Keriti Creek, Oct. 9th, 1942, *id.*, no. 3617. Trees 90 ft. high, 12–14 in. diam., unbuttressed, from Greenheart (3200) and Kakaralli (3617) bush. Fruit reddish or dull reddish purple, with a deciduous rusty tomentum. Seeds glossy, rounded-oval, red and black, known as " Jumbi beans".

Vernacular name (Arawak), *Barakaro.*

Distr. Surinam, Amazonian Brazil. First record for British Guiana.

Sclerolobium micropetalum *Ducke* in Bol. Tecn. Inst. Agron. do Norte, **2,** 20 (1944).

Moraballi Creek, Essequibo River, fl. Oct. 9th, 1940, *D. B. Fanshawe* in *Forest Dept.* no. 3310 : tree 126 ft. high (measured), 16 in. diameter, with low irregular buttresses, from mixed forest on reddish loam ; margins of leaflets revolute, perhaps young, in other specimens not revolute ; fls. yellow, strongly sweet-scented, in loose compound panicles ; buds pale yellow-green ; calyx petaloid, lobes concave patent, pale yellow, much larger than petals ; petals flat, yellow ; stamens in two series, erect-spreading, inner shorter ; ovary hairy.

Ibid., fr. March 28th, 1941, *Fanshawe* in *Forest Dept.* no. 3394 : tree 140 ft. high, 24 in. diam., buttressed to 6 ft. up, from Kautaballi (*Licania venosa* Rusby) forest ; leaflets rugose, smooth ; fruit flat, glaucous-green, elliptical, becoming dry and dehiscent.

Vernacular name (Arawak), *Yawarridan* (this is given also to *S. guianense* Bth., and to *S. melinonii* Harms in Surinam).

Distr. Manáos, Amazonian Brazil.

This very distinct species is easily recognised by the slender racemes of small pedicellate flowers with short glabrous petals. It is perhaps most nearly related to *S. melinonii* Harms, of Surinam and French Guiana, which is immediately distinguished by the smaller leaves with stellate hairs on the lower surface of the fewer leaflets, by the short panicles with densely tomentellous pedicels and calyces, and the much shorter fruits. Its petals also are longer, and pilose at the base. *S. guianense* Bth., a native of Guiana and perhaps of Amazonian Brazil, is well known in British Guiana where it has been collected in forests by the Moraballi Creek. It differs still further from *S. micropetalum* on account of the spreading rusty-red hairs and the subsessile flowers, while its pods are short and truly elliptic in outline.

Forest Dept. no. 3310 matches excellently the type (flowering) collection of *S. micropetalum* (*Ducke* 1219) from Manáos, where Ducke found only two very large trees in upland rain forest. The pod may now be described from the material of *Forest Dept.* 3394, as follows : *legumen* lineari-oblongum vel anguste elliptico-oblongum, apice obtusum brevissime mucronatum, basi in stipitem 2 mm. longum acute cuneato-attenuatum, 10–18 cm. longum, maturescens 2·3–2·6 cm. latum, planum, glabrum, statu vivo glauco-viride siccitate nigrescens ; pedicelli vetusti 4–6 mm. longi, 1–1·2 mm. crassi.

Bauhinia cinnamomea *DC.* ; Amshoff in Pulle, Fl. Surinam, **2** (2), 46 (1939).

Mazaruni River : Takutu Creek to Puruni River, Oct. 20th, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4770 : soft-wooded tree to 30 ft. high and 4 in. diam., locally common in low ropy bush and Mora forest ; buds purplish brown ; petal 1, linear, white. Also seedling examples, same place and date, no. 4771.

Distr. Surinam, French Guiana. First record for British Guiana. Determined by Dr. J. Amshoff, of Utrecht. Previously unrepresented at Kew.

Macrolobium limbatum *Spruce ex Benth.* in Mart. Fl. Bras. **15** (2), 218 (1870).

Bartica-Potaro road, 108 miles, at Mahdia Creek, fl. June 28th, 1942, *D. B. Fanshawe* in *Forest Dept.* no. 3488 : tree 60 ft. high, 8 in. diam., from Kakaralli-Clump Wallaba forest on lateritic ironstone soil ; flowers in small down-curved spikes ; sepals green, reflexed ; petal orange, red, cream or white, crimped and curled ; stamens red. Also seedlings, on the same road at 107 miles, Nov. 17th, 1943, no. 4247.

Distr. Amazonian Brazil and Peru. First record for British Guiana.

M. suaveolens *Spruce ex Benth.*, l.c., 219 (1870).

Bartica-Potaro road, 107 miles, fl. and fr. Nov. 12th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 4206 : tree 40 ft. high, 6 in. diam., from Kakaralli-Clump Wallaba forest ; flower spikes down-curved ; calyx pale green, reflexed ; petal withered, red when fresh.

Distr. Amazonian Brazil. First record for British Guiana.

A form or variety, with the ovary wholly tomentose. There are no fruits with the Brazilian material at Kew, nor had Bentham seen them.

M. montanum *Ducke* in Arch. Jard. Bot. Rio de Janeiro, **4,** 49 (1925) ; in Tropical Woods, no. **65,** p. 28 (1941).

Bartica-Potaro road, 83 miles, fl. and fr. July 1st, 1942, *D. B. Fanshawe* in *Forest Dept.* no. 3500 : undergrowth tree to 40 ft. high and 4 in. diam., from Clump Wallaba forest on white sand, extremely local in distribution, only seen between 83 and 84 miles and there abundant ; flowers in short erect spikes, subtended by papery pale green bracts ; petal white, lamina spoon-shaped and involute ; stamens red ; fruit sulcate, apiculate, flat.

Distr. Amazonian Brazil ; abundant but extremely local in the Jutahy region, State of Pará.

The bracteoles of this material are longer and more acute, and the claw of the petal is longer, than in Ducke's type collection, *Herb. Jard. Bot. Rio* 16497, at Kew. The British Guiana tree is perhaps a distinct variety. The species is related to *M. multijugum* Benth.

Macrolobium acaciifolium (*Benth.*) *Benth.* var. **vestitum** *Sandwith*, var. nov. ; a planta typica ramulis velut inflorescentia dense flavicanti-pilosulis, praeterea foliorum rhachi foliolis secus margines et utrinque secus costam similiter indutis differt.

British Guiana. Mazaruni River, Oct. 1st, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4748 (typus in Herb. Kew.) : tree 70 ft. high, 16 in. diam., leaning over riverbank.

On the type and all the other numerous specimens of *M. acaciifolium* which have been examined the inflorescence is densely pilosulous but the branchlets are completely glabrous. The leaves of many collections are also quite glabrous, but in others they show hairs along the lower half of the midrib on the lower surface of the leaflets, and in one, *Forest Dept.* 2101 from Apoteri, Rupununi River, hairs can be seen along the margins of the leaflets and also on the leaf rhachis. The last-named collection indicates a transition to the marked development of indumentum on the leaves and especially on the branchlets of var. *vestitum.*

Crudia oblonga *Benth.*, Bot. Voy. Sulph, 89, in obs. (1844) ; in Mart. Fl. Bras. **15** (2), 238, in obs. (1870) ; Amshoff, "On S. Amer. Papilionaceae", 13 (1939).—*C. pubescens* Spruce ex Benth. in Mart. Fl. Bras., l.c., 240.

Arapiakoro Creek, Pomeroon River, Jan. 18th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 3969 : tree 50 ft. high, 8 in. diam., by creekside. Common on banks of Bonasika Creek, Essequibo River, March 1909, *C. W. Anderson* in *Forest Dept.* no. 269.

Distr. French Guiana, Amazonian Brazil. First records for British Guiana.

Calliandra hymenaeoides (*Pers.*) *Benth.* in Trans. Linn. Soc. **30,** 537 (1875), ex descr.

Bartica-Potaro road, at 107 miles, fl. Nov. 15th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 4224. Small tree 30 ft. high, 3 in. diam., from Clump Wallaba forest. Corolla tube white ; filaments very long, crimson in upper half ; anthers black.

Distr. French Guiana. First record for British Guiana. A rare species, hitherto unrepresented at Kew.

Pithecellobium (Sect. *Abaremotemo*) **mataybifolium** *Sandwith*, sp. nov. ; *P. filamentoso* Benth. affinis, foliolis multo longius petiolulatis vulgo distincte acuminatis, inflorescentiis praesertim calycibus indumento crispulo-furfuraceo ferrugineo indutis, pedunculis brevioribus differt.

Arbor parva ; ramuli subteretes, glabrati vel minutissime furfuraceo-puberuli, lenticellati. *Stipulae* non visae. *Folia* glabra ; petiolus 1·5–2·5 cm. longus ; pinnae 1-jugae, 15–25 cm. longae, internodiis rhacheos 2·3–5 cm. longis ; glandulae cortice immersae vix distinguendae ; petioluli 5–6 mm. longi, vulgo 1·3 mm. lati ; foliola 2–3-juga, elliptico-lanceolata vel elliptico-oblonga, terminalia nonnunquam obovato-elliptica, apice breviter (5–7 mm.) late obtuse acuminata vel nonnunquam obtusa, basi obliqua latere superiore rotundato inferiore vulgo attenuato acuto, 5·5–14 cm. longa, 2·7–7 cm. lata, firme chartacea, glabra, subtus glauca, marginibus praecipue basin versus revolutis, nervis venulisque exacte ut in *P. filamentoso* utrinque prominenter reticulatis. *Pedunculi* axillares 1–2, 2·5–5·5 cm. longi, velut rhachis pedicellique pilis minutis crispulo-furfuraceis juventute ferrugineis puberuli. *Flores* secus rhachin brevem racemoso-capitati ; pedicelli

0·75–2·5 mm. longi ; bracteae deciduae, non visae. *Calyx* extra siccitate ferrugineo-tomentellus, infundibuliformis, totus 3 mm. longus, apice tubi 2·5–3 mm. latus ; dentes deltoideo-triangulares, obtusi, inaequales, ad 0·6 mm. longi, basi 0·5–1·2 mm. lati. *Corolla* pallide viridis, tubuloso-infundibuliformis, tota 7 mm. longa, tubo ad 3 mm. latitudinem ampliato pro maxima parte glabro sed extra secus nervos de mediis lobis descendentes pubescente ; lobi ovato-lanceolati, 1·5–2·5 mm. longi, 1–1·5 mm. lati, extra praesertim apice satis dense crispule pubescentes, marginibus apicem versus involutis apice ipso cucullatis. *Stamina* alba, circiter 2·8 cm. longa, tubo in corolla incluso. *Ovarium* oblongum, glabrum, apice annulato-incrassatum. *Legumen* non visum.

British Guiana. Bartica-Potaro road, 107 miles, Nov. 15th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 4232 (typus in Herb. Kew.) : tree 30 ft. high, 3 in. diam., from Kakaralli-Clump Wallaba (*Dicymbe*) forest ; leaflets 2–3 pairs, chartaceous, glaucous below, margins revolute ; fls. in axillary capitula ; calyx br. [bright?] green, tomentose ; corolla pale green, lobes patent to slightly reflexed ; stamens white.

This is very closely allied to *P. filamentosum* Benth., a little known species the type of which (with only detached leaflets) was collected by Martius on the Rio Doce, Brazil, the only other authentic collection being that of Otto in Venezuela, of which there are three sheets at Kew. Further collections of this species from intervening localities may necessitate the reduction of *P. mataybifolium* to varietal rank.

Another ally is evidently *P. adenophorum* Ducke, which differs in the shorter, broadly rounded, obovate-elliptic leaflets, the large glands on the leaf rhachis, and the smaller flowers on very much longer pedicels.

Pithecellobium (Sect. *Abaremotemo*) **fanshawei** *Sandwith*, sp. nov. ; *P. arenario* Ducke atque *P. villifero* Ducke affinis, ab ambobus foliorum pinnis plurijugatis, glandulis conspicue stipitatis, foliolis minoribus differt ; praeterea ab illo indumento multo longiore, legumine dense fulvo-piloso, ab hoc foliolis numerosioribus rhomboideis distinguitur.

Arbor parva vel excelsa ; ramuli subteretes, foliorum rhaches inflorescentiaeque ubique pilis patentibus mollibus ferrugineis vel flavescentibus inaequalibus longioribus 1–1·3 mm. longis dense villosae. *Stipulae* non visae. *Folia* vulgo 10–17 cm. longa, petiolo 1–1·5 cm. longo ; internodia rhacheos 0·6–1·5 cm. longa ; pinnae 6–9-jugae, mediae terminalesque 3–5·5 cm. longae ; glandula inter pinnas ipsas atque foliola pinnarum superiora conspicue (nonnunquam fere ad 1 mm.) stipitata ; foliola pinnarum superiorum 10–14-juga, pinnarum imarum usque 5-juga, oblique rhomboideo-oblonga, terminalia obovato-elliptica, apice obtusa vel acutiuscula, 0·4–1·1 cm. longa, 2–4 mm. lata, senectute coriacea revoluta, supra subvernicoso-nitidula rugosula satis sparse pilosula, subtus pallidiora atque densius longius praesertim secus costam flavescenti-pilosa, nervis venulisque supra prominulo-reticulatis subtus costa nervisque primariis exceptis vix obviis. *Pedunculi* in axillis superioribus hornotinis solitarii, 3–6·5 cm. longi. *Flores* subsessiles capitati, capitulo ad 1·4 cm. diametro ; bracteae lineari-oblongae, ad 3·3 mm. longae, ad 0·75 mm. latae, extra pilosae. *Calyx* viridis, infundibuliformis, extra patule pilosus, totus 4·5–5 mm. longus, apice tubi 3–3·5 mm.

latus ; dentes deltoideo-triangulares, acuti, 1–1·5 mm. longi, basi ad 1·3 mm. lati. *Corolla* sordide alba, infundibuliformis, extra dense subadpresse flavescenti-pilosa, tota ad 6·5 mm. longa, tubo ad 3 mm. latitudinem ampliato ; lobi ovato-lanceolati vel ovato-triangulares, ad 2 mm. longi, ad 1·5 mm. lati, apice involuti cucullati. *Stamina* alba, circiter 3 cm. longa, tubo e corolla juventute haudquaquam serius distincte vel etiam longe exserto. *Ovarium* superne pilis subadpressis flavescentibus dense vestitum ; stylus glaber. *Legumen* valde falcato-curvatum vel circinatum, post dehiscentiam contortum, 6–12 cm. longum, ad 1·5 cm. latum, planum, marginibus paulo incrassatis, dense praesertim marginibus fulvo-pilosum, sutura superiore inter semina sinuata.

British Guiana. Bartica-Potaro road, 107 miles, in Kakaralli (*Eschweilera*)—Clump Wallaba (*Dicymbe*) forest, Nov. 11th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 4181 (typus in Herb. Kew.) : tree 30 ft. high, 5 in. diam., with rhomboidal leaflets and soft brown hairs on rhaches and midribs ; fls. capitate on axillary peduncle ; calyx green, pilose ; corolla dirty white, pilose ; stamens white. *Ibid.*, 108 m., at Mahdia Creek, Potaro River, June 29th, 1942, *Fanshawe* in *Forest Dept.* no. 3490 : tree 6 in. diam, with shoots 30 ft. high (grows to 120 ft. high and 20 in. diam.), from Kakaralli-Clump Wallaba forest on lateritic ironstone soil; fruit semilunar, flat, hairy, olive-brown, contorting on dehiscence.

There is in the Kew Herbarium a fragmentary fruiting specimen collected by " Schomburgk " (without no.) which was assigned by Bentham (Mimoseae, p. 584) to his *P. ferrugineum* Benth. and from which he then took his description of the pod, which was not present on his type material of that species (*Robert Schomburgk* 663) from Roraima. As noted on the sheet by Mr. N. E. Brown, these fragments are not in the least like *P. ferrugineum*. They agree closely with *P. fanshawei* in the indumentum of the branchets and leaves, in the stipitate glands, and in the single pod, which has dehisced and is contorted, but the leaflets are larger, up to 2 cm. long and 1 cm. broad, and the number of pinnae and leaflets cannot be determined. They must represent either a form of *P. fanshawei* or a very closely allied species. Fortunately, they were not used by Bentham when he drew up his original description of *P. ferrugineum*, in Hook. Lond. Journ. Bot. **3**, 216 (1844).

The two rather close allies of this species, easily distinguished by characters given in the diagnosis, are small trees of sandy or siliceous soil in forests of the Rio Negro and its tributaries. Another ally from the same region of Brazil, *P. auriculatum* Benth., has the pinnae of the leaves 5–7-jugate but the leaflets are glabrous and the branchlets and leaf rhaches are clothed with extremely short curly hairs.

Pithecellobium (Sect. *Caulanthon* Benth.; gen. *Zygia* P. Br.) **collinum** *Sandwith*, sp. nov. ; *P. umbrifloro* Ducke affinis, pinnis 6–7-jugis, foliolis minoribus in quaque pinna multo numerosioribus, floribus majoribus differt.

Arbor parva, habitu vulgo contorto, ramulis subteretibus lenticellatis minute fulvo-puberulis. *Stipulae* non visae. *Folia* petiolo brevissimo 3–4 mm. longo velut rhachi pinnisque crispule pilosulo ; internodia

rhacheos 1·5–3·5 cm. longa ; pinnae 6–7-jugae, ad 12 cm. longae sed inferiores gradatim breviores imae male evolutae 1–4 cm. longae ; glandula inter pinnas ad 1 mm. diametro ; foliola in pinnis mediis superioribusque 12–15-juga, in pinnis inferioribus pauciora ac in imis nonnunquam 5-juga, sessilia, subrhombeo-falcato-oblonga, apicem acutum versus sensim attenuata ac apice ipso pungenti-mucronata, basi obliqua latere inferiore rotundato-auriculata, 1–3 cm. longa, 0·3–1·15 cm. lata, firme chartacea vel subcoriacea, utrinque nitidula, secus costam inferne marginesque revolutos sparse pilosula ceterum glabra, costa utrinque prominula, nervis lateralibus venulisque supra obscuris subtus prominulis et laxe reticulatis. *Racemi* trunci ramulorumque defoliatorum nodis fasciculati, brevissimi, ad 1·5 cm. longi, usque ad basin floriferi, fulvo-pubescentes. *Flores* albi, sessiles ; alabastra claviformia sed sensim tantum ad apicem ampliata ; bracteae triangulari-ovatae, anguste acute acuminatae, circiter 1 mm. longae, ad 1·2 mm. latae, extra pubescentes. *Calyx* tubulosus, 2·8–3 mm. longus, 1·2 mm. latus, extra praesertim superne pubescens ; dentes triangulari-deltoidei, acuti, 0·2–0·3 mm. longi. *Corolla* tota 9–9·5 mm. longa, inferne glabra superne extra haud dense pubescens ; tubus basi 1–1·2 mm. diametro, sensim ad 2·5 mm. latitudinem ampliatus ; lobi ovato-lanceolati vel ovati, inaequales, 1–1·5 mm. longi, circiter 1 mm. lati. *Stamina* alba, 1·8–1·9 cm. longa, tubo e corolla breviter exserto. *Ovarium* glabrum, margine superiore leviter sulcato. *Legumen* non visum.

British Guiana. Groete Creek, Lower Essequibo River, April 16th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 3976 (typus in Herb. Kew.) : tree 20 ft. high, 4 in. diam. (grows to 60 ft. high and 12 in. diam.), locally abundant on tops of ironstone hills, even where capped with brown sand ; rarely grows straight or cylindrical, usually twisted and fluted, and adventitious shoots are common ; flowers cauliflorous, bunched, white, sweet-scented, on stem below leaves to within 8–10 ft. of the ground.

Vernacular name, *Uriridan* (Arawak).

This species is also related to *P. claviflorum* Spruce ex Benth. and *P. basijugum* Ducke, small trees of Amazonian Brazil and Peru, each of which has the lower margin of the leaflets produced and acutely auricled at the base. In addition, *P. claviflorum* has leaflets obtuse or rounded at the apex, abruptly clavate buds, and reddish purple flowers and stamens ; while *P. basijugum* has smaller leaflets, compound inflorescences with capitate heads, and much shorter calyces.

A specimen from the Kaieteur Savannah, collected by *E. F. im Thurn* on February 23rd, 1879, is apparently referable to *P. claviflorum* (*Abarema claviflora* (Spruce ex Benth.) Kleinh.), which has also been collected in Surinam.

Pithecellobium (Sect. *Caulanthon* Benth. ; gen. *Zygia* P. Br.) **eperuetorum** *Sandwith*, sp. nov. ; *P. amplo* Spruce ex Benth., *P. brevispicato* Ducke atque *P. truncifloro* Ducke affinis, sed pinnis foliorum 2-jugis, floribus conspicue pedicellatis statim distinguitur ; praeterea a *P. lehmannii* Harms, quae floribus pedicellatis gaudet, foliolis glabris corolla multo minore differt.

Arbor parva, ramulis subteretibus glabratis. *Stipulae* non visae. *Folia* magna ; petiolus 0·5–1 cm. longus, minute pubescens vel glabratus ; internodium rhacheos (unum tantum integrum visum) 8 cm. longum, 2·5 mm. diametro, minute pubescens vel glabratum ; pinnae 2-jugae, ad 37 cm. longae ; internodia 3·5–7 cm. longa, 1·3–2·3 mm. diametro, minute pubescentia vel glabrata ; glandula inter pinnas ovata vel elliptica, plana, senectute cortice obtecta atque vix obvia ; petioluli 2·5–5 mm. longi, juventute minute pubescentes ; foliola 3–4-juga, elliptico-lanceolata vel oblongo-lanceolata, terminalis nonnunquam subfalcata, apice ad 1·5 cm. acuminata, basi obliqua antice angustius attenuata, 7·5–14 cm. longa, 2·3–5·5 cm. lata, coriacea, glabra, nervis primariis utroque costae latere circiter 6–8 imis 2–3 prope basin exorientibus atque sursum longe ascendenti-arcuatis omnibus marginem versus anastomosantibus, costa utrinque prominente venulis subtus satis prominenter reticulatis. *Racemi* in trunco vel ramulis vetustioribus fasciculati vel paniculati, circiter 2 cm. longi, ubique griseo- vel ferrugineo-pubescentes. *Flores* secus rhachin dispositi neque capitati, conspicue pedicellati, pedicellis 1–2 mm. longis ; bracteae parvae, late ovatae, vulgo 0·5 mm. longae. *Calyx* tubulosus, totus 2·3–2·75 mm. longus, vix 1·5 mm. latus, dense pubescens ; dentes late triangulari-deltoidei, acuti, inaequales, ad 0·3 mm. longi. *Corolla* glauco-viridis, tota ad 9·5 mm. longa, extra basi glabra excepta satis dense pubescens ; tubus inferne anguste cylindricus circiter 0·75 mm. latus, tum ad 3 mm. latitudinem ampliatus ; lobi lanceolati et ovato-lanceolati, ad 2·3 mm. longi, ad 1·3 mm. lati. *Stamina* ad 3 cm. longa, dimidio superiore kermesina, tubo e corolla exserto. *Ovarium* glabrum vel sub lente forti plus minusve ferrugineo-tomentosum, margine dorsali (inferiore) sulcato. *Legumen* non visum.

British Guiana. Bartica-Potaro road, 30 miles, fl. Nov. 10th. 1943, *D. B. Fanshawe* in *Forest Dept.* no. 4170 (typus in Herb. Kew.) : tree 10 ft. high, 2 in. diam. (grows to 40 ft. high and 3 ft. diam., but straggly), very common in wallaba (*Eperua*) forest ; leaves leathery, venation obscure ; fls. cauliflorous on stem and branchlets, bunched ; calyx pale green ; corolla glaucous green ; stamens exserted, crimson in upper half ; other trees rarely bore white stamens.

Ibid., 23 miles, August 28th, 1942, *Fanshawe* in *Forest Dept.* no. 3563 : undergrowth tree to 15 ft., in wallaba forest ; wood hard ; leaves stiff and brittle ; fls. cauliflorous on lower stem, withered ; calyx and corolla tomentose ; pod olive green, rough, opening ventrally, flat ; seeds oval, shiny, translucent pale green, i.e. testa whitish, translucent, cotyledons dark green.

Easily distinguished from its allies by the characters given in the diagnosis. *P. amplum*, moreover, has the leaflets pubescent along the main nerves, subcapitate racemes, and (according to Spruce) a vermilion calyx and corolla.

Inga (Sect. *Pseudinga*) **stipularis** *DC.*, Mém. Legum. 440 (1825).

Bartica-Potaro road, 108 miles, at Mahdia Creek, fl. June 27th, 1942, *D. B. Fanshawe* in *Forest Dept.* no. 3481 ; at 95 miles, fr. Nov. 10th, 1943, *id.* in *Forest Dept.* no. 4173. A small tree of second growth, up to 30 ft.

high, on lateritic ironstone soil. Corolla tube white, lobes pink ; stamens white.

Distr. Guiana, Amazonian Brazil. First record for British Guiana.

Inga (Sect. *Pseudinga*) **rhynchocalyx** *Sandwith*, sp. nov. ; ex affinitate *I. acuminatae* Benth. quae alabastris calycibusque forma omnino similibus gaudet, sed foliolis latioribus haud vel vix acuminatis, pedunculis brevioribus rigidis, racemis elongatis, bracteis deciduis, floribus longioribus differt.

Arbor mediocris, ramulis fere teretibus brunneis valde lenticellatis glabratis. *Stipulae* deciduae, non visae. *Folia* usque 24 cm. longa, supra ubique siccitate plumbea nitidula, subtus pallidiora brunnea ; petiolus 2–3 cm. longus, superne sensim anguste marginato-alatus vel nonnunquam alis ad 3 mm. latis praeditus ; internodia rhacheos 2–4 cm. longa, alis 3–6 mm. latis ; glandulae sessiles 1·5–2 mm. diametro ; petioluli 1–1·5 mm. longi ; foliola 3-juga, elliptica vel elliptico-ovata, apice obtusa vel saepius late breviter (ad 1 cm.) acuminata, basi ipsa rotundata vix cordatula, superiora 12–16 cm. longa, 4·5–8 cm. lata, jugi imi minora, omnia firme chartacea vel coriacea, adulta glabrata sed pilis raris secus costam nervosque persistentibus induta, costa nervisque primariis utrinsecus 12–14 supra subplanis subtus prominentibus, nervis ascendentibus sursum arcuatis marginem versus anastomosantibus, rete venularum supra obscuro subtus vix prominulo. *Racemi* 1–3 axillares ; pedunculi robusti, recti, subteretes, 1–3·5 cm. longi, glabrati sed apice obscure adpresse pilosuli ; pars florifera 2·7–5 cm. longa, apice excepto cicatrices crebras florum delapsorum tantum exhibens ; bracteae jam ante florum expansionem deciduae, angustae, subulatae, canaliculatae, flexuosae, circiter 5 mm. longae, 0·3 mm. tantum latae, adpresse pilosulae. *Flores* subsessiles. *Alabastra* subclavato-cylindrica, apice longe (3 mm.) conspicue rostrata, siccitate brunnea, adpresse pilosula. *Calyx* cylindricus, sensim in rostrum saepius clausum convolutum integrum attenuatus, de rostro profunde unilateraliter usque medium vel ultra spathaceo-fissus, rostro incluso 1·2–1·3 cm. longus, 2·5–3 mm. latus, satis tenuis, longitudinaliter striatus, adpresse pilosulus. *Corolla* tota 1·7–2 cm. longa, extra dense adpresse subsericeo-pilosa, siccitate flavida, tubo 1·5–2 mm. diametro, lobis lanceolatis 4–4·5 mm. longis circiter 1·2 mm. latis. *Stamina* alba, ad 3·5 cm. longa, tubo e corolla paulo exserto. *Ovarium* cylindricum, glabrum ; stylus glaber, stamina paulo superans ; ovula 24. *Legumen* non visum, teste lectore qui exempla in terra jacentia repperit ad 45 cm. longum, planum, latum, tortum.

British Guiana. Keriti Creek, Essequibo River, Oct. 13th, 1942, *D. B. Fanshawe* in *Forest Dept.* no. 3622 (typus in Herb. Kew.). " Tree 90 ft. high, 16 in. diam., buttressed to 3 ft. Leaves 2–3-jugate [only 3-jugate leaflets were present on the type material], leaflets glossy. Fls. pale creamy. Calyx greenish. Stamens white. Fruit (from the ground) up to 45 cm. long, flat, broad, twisted."

Vernacular name, *Warakusa* (Arawak).

The obvious ally of this species is *I. acuminata* Benth., which differed from all other Ingas known to Bentham in the remarkably acuminate

flower-buds (see Trans. Linn. Soc. **30,** 618 ; Hook. Ic. Pl., t. **1202**). *I. acuminata* was for long believed to be endemic in Trinidad, but it has recently been recorded from Venezuela by Pittier (Cat. Pl. Venez. p. 352 (1945)), and it apparently occurs in Ecuador. *Eggers* 15825, from Ecuador, is clearly referable to this species and the unnumbered Eggers specimen from El Recreo, Ecuador, in the Field Museum, which was mentioned by Pittier in his Revision of *Inga* (Contr. U.S. Nat. Herb. **18,** 195 (1916)), is probably part of the same gathering. There seems to be no reason for suspecting that these specimens were really collected by Eggers in Trinidad.

I. rhynchocalyx is easily distinguished from *I. acuminata* by the characters given in the diagnosis, and it would seem that it has much longer pods since those of *I. acuminata* are only 10–20 cm. long (see Williams in Fl. Trinidad and Tobago, **1,** part 4, p. 304). The caducous bracts lend support to Pittier's comment (Revision of *Inga*, p. 193) that Bentham's series *Pilosiusculae* and *Leptanthae* " appear to be distinguished from each other only by artificial and somewhat arbitrary characters".

I. hartii Urb., of Trinidad and Venezuela, which was contrasted by its author with *I. acuminata* (see Symb. Ant. **1,** 312) although he did not attribute to it the peculiar beaked and spathaceously split calyx of that species, has broad stipules, a terete or nearly terete petiole, a short flowering rhachis, persistent bracts and thick pods. There is no authentic material at Kew of this species, only a sheet with detached leaflets and fruit which has been compared with the type collections. The leaflets on this sheet are papery, long-acuminate and loosely pilosulous all over the lower surface, while the pod is thick. This material does not resemble *I. acuminata* and *I. rhynchocalyx*. Moreover, Pittier transferred *I. hartii* to the series *Calocephalae* (Revision, pp. 195, 221).

Two other species have recently been described which are related to *I. acuminata* and *I. rhynchocalyx* on account of the form of their calyces. *I. chrysantha* Ducke, in Bol. Tecn. Inst. Agron. do Norte, **2,** 6 (1944), of Amazonian Brazil, has lanceolate long-acuminate leaflets in 2–5 pairs, a short calyx only 5–8 mm. long, and pale golden stamens. *I. urabensis* Uribe, in Caldasia, **4,** 406 (1947), of Colombia, has very large leaves with leaflets in 4 pairs and up to 30 cm. long and 15·5 cm. broad, persistent bracts and bright yellow stamens. A specimen at Kew, *A. E. Lawrance* 779, from the El Humbo region, State of Boyacá, Colombia, agrees well with Uribe's description except for the loose but copious pilose indumentum on the lower surface of the leaflets. Lawrance's tree grew in high forest at 1000 ft., and was described as 75–150 ft. high and 1–4 ft. in diameter, with bright canary yellow flowers, the vernacular name being " Guamo Montañero". The material was identified by an American botanist as " *I. ?fastuosa* Willd.", i.e. as *I. fastuosa* (Jacq.) Willd., but a glance at Jacquin's superb plate of his *Mimosa fastuosa* (Fragmenta Bot., t. **10**) shows a plant with spreading hairs, an equally 5-lobed calyx and pinkish-purple filaments.

Melastomataceae

Mouriri sagotiana *Tr.* in Trans. Linn. Soc. **28,** 155 (1871) ; Gleason in Pulle, Fl. Surinam, **3,** 277 (1935).

Siba Creek, Moraballi Creek, Essequibo River, April 9th, 1941, *D. B. Fanshawe* in *Forest Dept.* no. 3412. " A small undergrowth tree up to 4 in. diam. and 30 ft. high, local in mixed forest in rocky country. Skin and wood exactly as in *M. sideroxylon.* Leaves supple. Calyx green. Corolla yellow, petals reflexed. Filaments yellow. Fruit subglobose, green, fluted."

Vernacular name (Arawak), *Shimarashiri.*

Distr. Guiana, Eastern Peru.

PASSIFLORACEAE

Passiflora ceratocarpa *Silveira* in Arch. Jard. Bot. Rio de Janeiro, **5,** 217, t. 30 (1930) ; Killip in Field Mus. Publ., Bot. Ser., **19,** 548 (1938).

Lower Essequibo River : Groete Creek, fr. March 4th, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4484. Brownish soft rope in mixed forest on lateritic soil ; leaves glaucous below ; fruit orange-yellow, with greyish black reticulate-ridged seeds.

Distr. Brazil ; Pará, lower Amazon Basin. First record for British Guiana.

CUCURBITACEAE

Cayaponia rigida (*Cogn.*) *Cogn.* in DC. Mon. Phan. **3,** 790 (1881).

Lower Essequibo River : Groete Creek, March 1944, *D. B. Fanshawe* in *Forest Dept.* nos. 4498 (fl.), 4502 (fr.). A vine in mixed forest on lateritic soil ; calyx brownish green ; corolla greenish white ; young fruit globose, green, fleshy, with faint cucumber scent. Mazaruni Station, in mixed forest on brown sand, fls. palest green, March 15th, 1946, *C. A. Persaud* in *Forest Dept.* no. 5353.

Distr. French Guiana. First record for British Guiana.

EBENACEAE

Diospyros melinoni (*Hiern*) *A. C. Smith* in Bull. Torrey Bot. Cl. **60,** 390 (1933).—*Maba melinoni* (sphalm. *mellinoni*) Hiern, Mon. Ebenaceae, 143 (1873).

Mazaruni Station, Jan. 30th, 1945, *D. B. Fanshawe* in *Forest Dept.* no. 5040 : tree 30 ft. high, 3 in. diam., from mixed forest ; leaves chartaceous, pruinose beneath ; young fruit solitary, axillary, subglobose, up to 1·5 cm. diam., covered with brown hairs and surrounded by the green accrescent calyx. Barabara Creek, lower Essequibo River, Dec. 7th, 1942, *Fanshawe* in *Forest Dept.* no. 3695 : tree 50 ft. high, 8 in. diam., unbuttressed, from wallaba forest ; leaves glaucous below ; flowers bunched, sessile ; buds and calyx green, with brown hairs ; corolla waxen white, erect at first, later revolute ; stamens white, covered with long white hairs.

Distr. French Guiana, Amazonian Brazil. First record for British Guiana.

D. dichroa *Sandwith* in Kew Bull. **1931,** 482.

Potaro River : Mahdia River, 107 miles on Bartica-Potaro road, Jan. 12th, 1943, *D. B. Fanshawe* in *Forest Dept.* no. 3752 : tree 110 ft. high, 20 in.

diam., with rough black bark, from Clump Wallaba forest on white sand ; leaves pale fawn below when young, silvery when old and velvety hairy ; buds bronze-tomentose ; calyx stiff, fleshy ; corolla lobes whitish, convolute, revolute at apex ; staminodes woolly ; ovary hairy ; fruit bronze-fawn, hairy, globose, the calyx spreading and eventually reflexed when the fruit is ripe.

The solitary axillary flowers of this collection are much larger than the unopened male flowers of the type (*Forest Dept.* no. 897) from the Mazaruni-Kuribrong Divide. The calyx lobes are up to 1 cm. long and 8–9 mm. broad, while the fully expanded corolla is 1·5–2 cm. long, the broad lines of dense yellowish-bronze hairs running down the middle (not the margins) of the outer surface of the lobes. The ripe fruit is 2·5–3·5 cm. in diameter, with a close soft adpressed tomentum, and the persistent calyx lobes are finally reflexed.

Symplocaceae

Symplocos martinicensis *Jacq.*

Essequibo River : Kamuni Creek, Groete Creek, April 17th, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4531 (*Maguire* 22, 873) ; tree 70 ft. high, 12 in. diam., unbuttressed, with white sweet-scented flowers, from mixed forest on lateritic soil. Mazaruni River : Takutu Creek to Puruni River, Oct. 13th, 1944, *Fanshawe* in *Forest Dept.* no. 4761 ; tree 60 ft. high, 8 in. diam., soft-wooded, with white flowers, from Mora forest on dry land.

Distr. West Indies : Puerto Rico to Trinidad. First record for British Guiana.

Styracaceae

Styrax fanshawei *Sandwith*, sp. nov. ; Sect. *Eustyrax*, Series *Valvatae*, *S. roraimae* Perk. affinis, foliis pro rata angustioribus siccitate saltem magis discoloribus subtus albidis longius petiolatis, corolla multo breviore differt.

Arbor excelsa, ramulis annotinis cortice fisso rugosis glabris sed hornotinis conspicue lepidotis. *Folia* anguste elliptica vel oblanceolato-elliptica, apice breviter (vulgo 5 mm.) acuminata, basi attenuata ac acute cuneata, 5·5–9·5 cm. longa, 1·6–3·5 cm. lata, coriacea, supra glabra, subtus ubique nisi nervis venulisque brunneis exstantibus densissime albido-lepidota, igitur discoloria, costa supra leviter canaliculata subtus prominente, nervis primariis utroque latere circiter 8 sursum arcuatis ac anastomosantibus, his venuliscum supra subplanis satis obscuris subtus prominulis atque supra paginam albidam pulchre reticulatis ; petiolus 1–1·4 cm. longus, dense albido-lepidotus. *Inflorescentiae* multae secus ramulos dispositae, racemosae, ubique densissime albido-griseo-lepidotae ; racemi 2–8-flori, 1–2 cm. longi ; bracteae basi pedicellorum lineares, 2–3 mm. longae ; pedicelli 4–6 mm. longi, angulati, flexuosi. *Flores* 9–10 mm. tantum longi. *Calyx* campanulato-cupularis, 4–5 mm. longus, 5·5 mm. latus, apice distincte denticulatus, dentibus late deltoideis 0·3–0·6 mm. longis obtusis sinibus rotundatis sejunctis, extra densissime flavescenti-lepidotus, intus pilis albis nitidulis arcte sericeus. *Corolla* alba, carnosa, circiter 9·5 mm. longa, 4 mm. lata, tubo glabro brevissimo 0·75 mm. longo, lobis valvatis oblongo-lanceolatis

fere 2·2 mm. latis extra densissime albido-lepidotis intus pilis albis praesertim dimidio superiore arachnoideo-lanatis. *Stamina* alternatim leviter inaequalia ; filamentorum pars libera leviter inaequalis, 1·75–2 mm. longa, inferne antice gibbosa atque dense albo-villosa ; antherarum loculi 4–4·3 mm. longi. *Ovarium* triloculare, multiovulatum, ovoideo-conicum, circiter 1·75 mm. longum atque latum, rugosum, lepidibus flavescenti-albidis longeradiatis tomentellum ; stylus glaber, cum stigmate indistincte trilobato circiter 6·5 mm. longus. *Fructus* non visus.

British Guiana. Siba Creek, Moraballi Creek, Essequibo River, April 1st, 1941, *D. B. Fanshawe* in *Forest Dept.* no. 3403 (typus in Herb. Kew.) : tree 130 ft. high, 16 in. diam., buttressed to 4 ft., irregular and spreading to 6 ft., frequent on one set of creek heads in " Turu " palm forest ; sap red ; leaves glaucescent beneath ; flowers 2–8 together in short axillary clusters ; calyx tubular, mealy green, barely lobed ; corolla tubular, white, fleshy, valvate in bud, lobed almost to base, lobes quite reflexed in flower ; flowers sweet-scented.

The evident ally of this fine tree is *S. roraimae* Perkins, which is known from a single collection, *Robert Schomburgk* 589, *Richard Schomburgk* 911. The Kew sheet of this differs from Mr. Fanshawe's material in its more shortly petiolate, relatively broader and less markedly acuminate leaves, the lower surface of which is pale green, not strongly discolorous with a whitish-lepidote surface conspicuously reticulate with brown veins. The flowers of *S. roraimae* are much larger, since the buds measure 1·4–1·5 cm., while Miss Perkins described the corolla tube as 2 mm. and the lobes as 12 mm. long.

S. micrasterus Perkins, of Venezuela, resembles *S. fanshawei* more closely in its lower leaf surface, but this species has much broader leaves. longer inflorescences and pedicels, with larger flowers and subtruncate, very obscurely denticulate calyces.

Monimiaceae

Siparuna cuspidata (*Tul.*) *DC.* ; Perkins in Engler, Pflanzenreich, **4,** 101 (1901).

Wineperu Creek, Essequibo River, Nov. 29th, 1946, *D. B. Fanshawe* in *Forest Dept.* no. 5413 : shrub 10 ft. high from secondary mixed forest on brown sand ; young shoots, peduncles and perianth covered with light brown scales ; flowers pinkish inside, the perianth involute ; plant has a faint smell similar to that of *S. guianensis.*

Distr. Surinam, French Guiana. First record for British Guiana.

Euphorbiaceae

Glycydendron amazonicum *Ducke* in Arch. Jard. Bot. Rio de Janeiro, **3,** 199 (1922).

Groete Creek, lower Essequibo River, June 20th, 1944, *D. B. Fanshawe* in *Forest Dept.* no. 4720 : tree 80 ft. high, 20 in. diam., unbuttressed, from mixed forest on lateritic soil ; whitish latex present in all parts ; fruits solitary, terminal on short axillary spikes, oblong, green, glabrous, fleshy.

Distr. Amazonian Brazil. First record for British Guiana.

Plate 1.

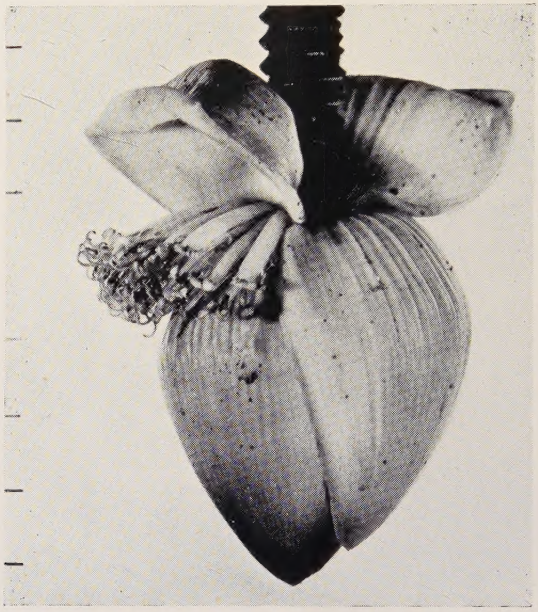

Fig. 1.

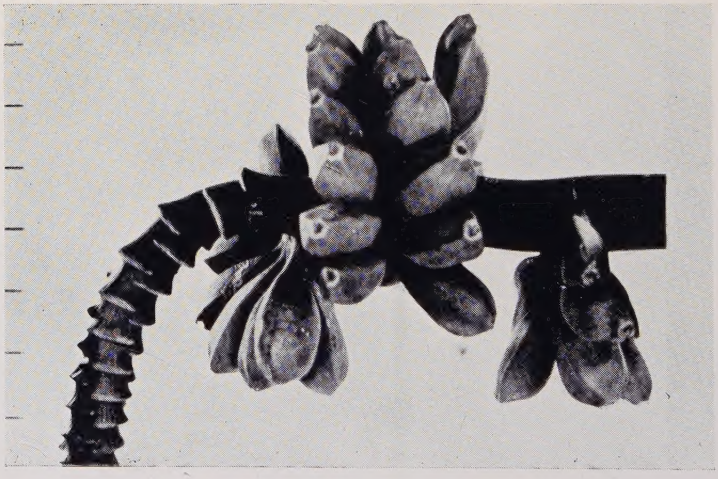

Fig. 2.

M. basjoo Sieb. Fig. 1. Male bud.
Fig. 2. Fruit bunch.
Scale in inches.

Photographs by K. S. Dodds